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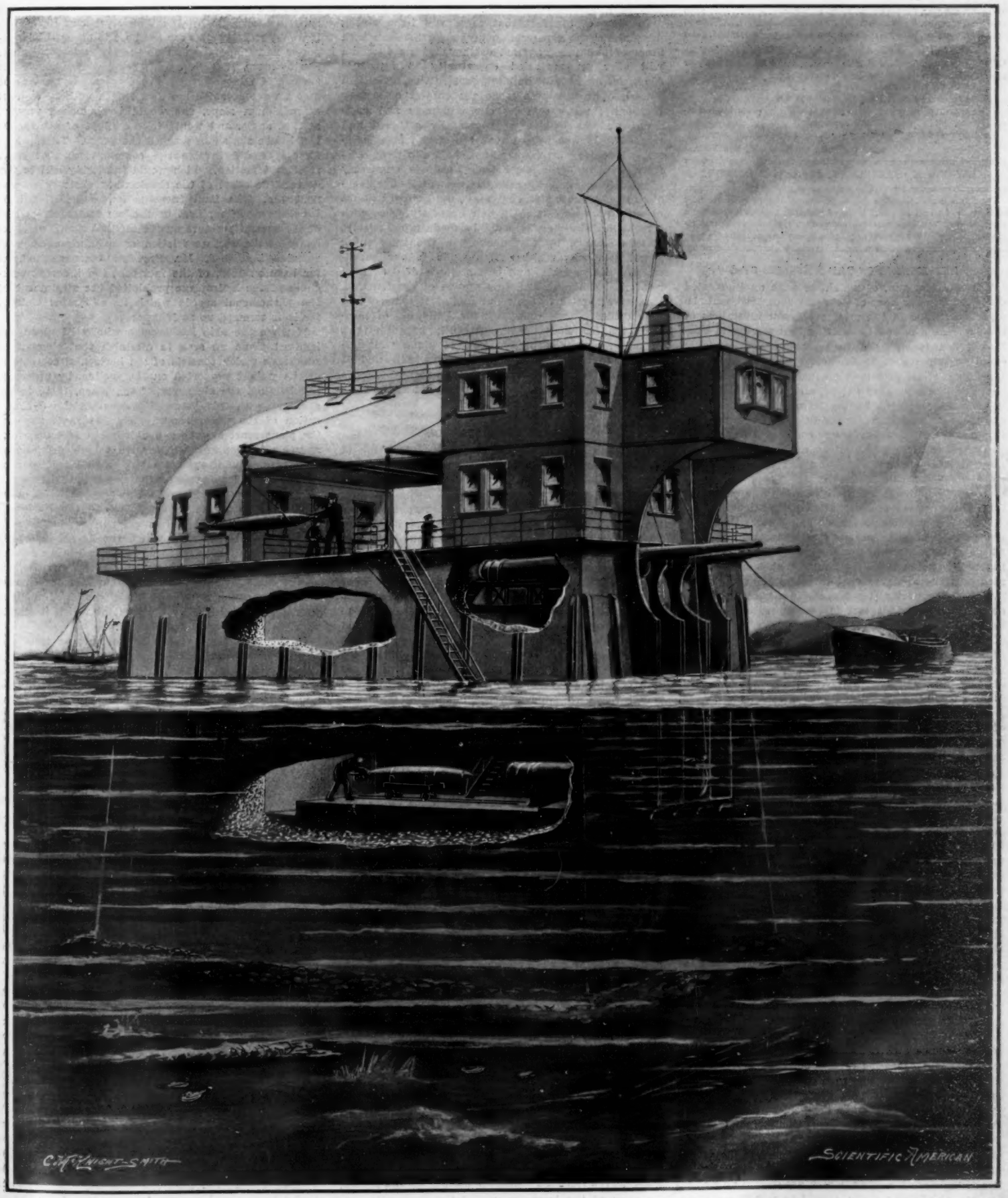

In this building the Schneider Company adjust and put in first-class running condition the new torpedoes built in their shops. The above-water launching tubes are seen below the projecting observation room. Below is seen a submerged launching tube.

A TORPEDO TESTING AND LAUNCHING STATION.—[See page 222.]

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NEW YORK, SATURDAY, MARCH 20th, 1909.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

THE MENACE OF THE NOISELESS GUN.

The noiseless gun, of which we gave an illustrated description in our issue of February 20th, 1909, must be regarded as one of the most successful inventions of the day. As a means of securing that secrecy in warfare which is essential to successful tactics, it is equal in importance to smokeless powder. To meet the attack of an enemy that can be neither seen nor heard will be a problem indeed, and the inventor is to be congratulated upon having introduced into warfare one more of those exacting conditions which are tending to make modern warfare so costly and destructive as to prohibit it altogether. In so far as the Maxim gun silencer renders war more difficult, it may be regarded as making indirectly for the preservation of peace, and, therefore, if we choose to so regard it, for the betterment of international conditions.

If it were possible to confine the possession of the new weapon to the military, for whose use, and for whose use alone, it was designed, we would have nothing to say against the device. But it cannot be denied that the appearance of this gun has greatly enlarged the opportunities for the commission of undetected crime. This fact is clearly realized by the Police Department of this city; and already the chief of police of the city of Pittsburg has taken steps to prevent the carrying of noiseless guns, and has announced his intention to prosecute, with the utmost severity that the law allows, all persons who are found in possession of the silencing attachment.

It is well understood that fear of detection is one of the most powerful deterrents to the commission of crime. It is because it does its work so silently that certain races prefer the knife or the stiletto to the rifle and revolver. The menace of the noiseless gun lies in the fact that the man with murder in his heart may now dispatch his victim in silence. Rarely does the burglar break into the home of the private citizen unarmed; and yet it is a fact, well understood by the police, that the last thing he desires is to be driven to use a revolver. But the housebreaker who carries a "silencer" might shoot the owner without the slightest fear of the report being heard by watchman or patrol, or even by the inmates of other rooms in the house. The new weapon is surer than the blackjack. A belated pedestrian might be shot, and the robbery of his person carried out, without the police on adjoining streets having the slightest suspicion that a crime was being committed. Not even the cover of night will be necessary for the concealment of deeds of violence. The fatal bullet can be sent to its mark on a crowded thoroughfare and in broad daylight, without there being any evidence of smoke or report to show whence it came.

The deadly character of the noiseless gun renders it, in the hands of unscrupulous people, a distinct menace to society; and we are strongly of the opinion that it should be made the subject of immediate and very stringent legislation. The principle upon which such a law would be founded is already recognized in the penalties which are attached to the carrying of concealed weapons. The frightful possibilities of undetectable crime, which are opened up by the appearance of this weapon, should be met by a statute declaring that the manufacture, sale, or possession of this weapon, for any but strictly military purposes, is a felony, and punishable by a long term of years in the penitentiary.

OPPORTUNITY FOR AMERICAN STEEL CONSTRUCTION AT MESSINA.

The United States consul at Naples has drawn attention in a recent report to the promising opening for American capital and enterprise in connection with the rebuilding of the city of Messina. It seems that the sentiment of the people is entirely in favor of reconstruction. Large sums of money have been expended in the improvement of the harbor, whose site and general excellence are such as to render its abandonment out of the question. Although, as yet, no definite plans have been formulated by the government, it is generally understood that, as soon as sanitary considerations will permit, the work of removing the debris of the city will be energetically carried through. It will be several months, however, before this work will be commenced.

In view of the fact that there will be a strong demand for the construction of houses that are both fireproof and proof against earthquake, the situation will offer an unrivaled opportunity to introduce American methods of building construction. The San Francisco disaster was made the subject of a very thorough investigation by our architects and engineers, and its lessons were carefully gathered and recorded. It was proved that the steel frame building, particularly in cases where the walls were carefully tied into the steel framework, is admirably adapted to resist earthquake stresses. Reinforced concrete construction, also, showed, in the limited amount of such work as existed in San Francisco, that, with certain modifications, it could be made proof against serious damage by earthquake. In the intervening years, great advance has been made in our knowledge of the strength, and best methods of design, of reinforced concrete; and this system of construction, if it were applied to the rebuilding of Messina, would be an ideal form, especially for buildings of moderate height. Our consul pertinently suggests that, in addition to the presentation of plans and estimates for rebuilding, American firms will find it greatly to their advantage to be represented on the spot by intelligent agents who are experts in the class of construction that is recommended.

THE SUBWAY SITUATION.

If the publication of plans and the submitting of proposals to the Public Service Commission is a guarantee of an early enlargement of rapid transit facilities in New York, the outlook for the future is rosy indeed. The company which is responsible for the Hudson tunnels has offered to extend its system by way of Sixth Avenue and Forty-second Street to the Grand Central terminal. The Interborough Company has proposed to enlarge its present system by the construction of a two-track subway from far north in the Bronx to the Battery, by way of Lexington Avenue and Seventh Avenue, and to increase the facilities of its elevated system by laying a third track for express service on its Second and Third Avenue systems; also it asks permission to lengthen the present subway platforms, to admit of the operation of ten-car express and six-car local trains. The Public Service Commission has announced that it is completing plans for a four-track system by way of Lexington Avenue and Broadway, to be built for most of the distance on two levels, with the local tracks above the express. It is understood that the Public Service Commission is disposed to grant the application of the Hudson Tunnels Company on the ground, not only that it will furnish a most important cross-town service connecting the steam railroads which enter the Grand Central station with those that terminate in New Jersey, but that it will bring the Sixth Avenue shopping district into convenient touch with the steam and electric roads, long-distance and local, of the east side of Manhattan Island. In granting this franchise the Public Service Commission will undoubtedly have the hearty indorsement of the general traveling public. The Commission is not disposed to grant the application of the Interborough Company, and this chiefly for the reason that it considers its own plans for a Lexington-Broadway four-track system to be greatly superior in convenience and capacity to the two-track systems proposed by the company. The request for permission to lengthen the existing subway platforms will undoubtedly be granted; for this change alone will result in an increase of the carrying capacity of the subway about twenty-five per cent. Moreover, it can be accomplished for $1,000,000—a very moderate outlay for an increase of carrying capacity of from 150,000 to 200,000 per day. The proposal to add a third track on the Second and Third Avenue elevated roads is certain to meet with popular opposition, on the ground that the existing elevated roads are a disfigurement to the city, and that to increase the trackage would further darken the streets. In view of the loosening up of the East Side congestion during the rush hours, which would result from the addition of these express tracks, we think that the Commission should hesitate before finally turning down this part of the Interborough's proposal.

LIMITATIONS OF THE HYDROPLANE.

The hydroplane is regarded as such a distinctly recent invention, that it will doubtless surprise many yachtsmen to learn that, as far back as the year 1872, the theory of this type of boat was most exhaustively investigated by William Froude, the father of the modern theories of the resistance of ships. According to our contemporary, the Yachting and Boating Monthly, the experiments carried out at Torquay, England, were made with two models, respectively 3½ and 10 feet in length. The lift and speed were recorded by special automatic apparatus. Mr. Froude found that the maximum resistance of a 2,500-ton ship would not be obtained until a speed of over 120 knots was reached. The first of the series of deductions arrived at was that even if by some extraneous means the ship could be started at the tremendous speed necessary to lift it completely out of the water, it would be impossible for the boat to carry the horsepower necessary to overcome the air resistance alone. Furthermore, if a ship were being driven along the surface of the water at a speed of say 60 knots, and met a wave of twice her own length with 10 degrees of maximum slope, she would be launched upward at that angle, and would take a flight of nearly 100 feet before she again reached the water. The upward impulse would involve the communication of some rotational motion, which would inevitably add to the destructive effect of the shock when she reached the next sea. The final investigation was directed to the determination, first of the horizontal component of the normal pressure on the inclined plane, and secondly of the surface friction of so much surface as remains immersed. Mr. Froude's demonstration, as far back as 1872, of the fact that the inherent principles of the hydroplane prohibited the attainment of the phenomenal speeds which its advocates claimed for it, is summed up as follows:

If when the ship has become wholly lifted on the inclined plane we seek to diminish that element of resistance which consists of the horizontal component of the weight supported on the incline, by reducing, say halving, the steepness of the plane, then, in order that with this flattened inclination the dynamic action of the water should yield the same support, the plane must assume a doubled area of immersion, and this doubled area will involve a doubled frictional resistance. But if again we seek to diminish the area of immersion by increasing the speed, the friction per square foot will be increased in the same ratio as the lifting force per square foot, and the immersed surface, though reduced in area, will retain the doubled frictional resistance which the halved steepness of the inclination introduced. Thus, while we reduce one element of the resistance in any given ratio, we at the same time increase the other element in precisely the same ratio, and their combined amount cannot be reduced below the limit at which it stands when the two elements are equal.

If the limitations of the hydroplane, as thus disclosed thirty-seven years ago by Mr. Froude's investigations, had been known, or fully understood during the recent revival of interest in this attractive device, much misdirected effort and inevitable disappointment would have been avoided.

AVIATION IN AMERICA AND THE SCIENTIFIC AMERICAN TROPHY.

Judging from the recent performances of Mr. McCurdy in Nova Scotia with the fourth aeroplane—the "Silver Dart"—of the Aerial Experiment Association, the year 1909 is to witness even more rapid progress in aviation here than was made in France last year.

After having made comparatively few practice flights, this young Canadian engineer, on March 10th, increased his previous records to nearly 20 miles in two flights of 13 and 22 minutes duration respectively. Two days before he had already made a flight of 11 minutes duration. The aeroplane, mounted on wheels, started and landed on the ice of Lake Bras d'Or, near Baddeck, N. S. In one of the flights this new aviator is said to have attained a height of 50 feet and to have performed various evolutions. At his request, the Aero Club of America is sending a representative to Nova Scotia to officially control a flight for the SCIENTIFIC AMERICAN Trophy, which it has recently been decided to award each year to the aviator who makes the longest flight in an official trial. Hereafter, anyone having a heavier-than-air machine which has shown itself capable of flight can have an official trial by notifying the Aero Club of America two or three days in advance, and remitting double the railway fare from New York to the point of trial, plus $4 for each day upon which a trial is to be made. The minimum distance for 1909 is 25 kilometers (15½ miles). If a sufficient number of machines are developed during the next few months, it is probable that a contest will be arranged near New York city.

The SCIENTIFIC AMERICAN Trophy has served a useful purpose in encouraging the development of new flying machines. From now on it will stand for the greatest achievement in aviation in America.

ENGINEERING.

Now that the misunderstandings between the railroads and the manufacturers have been removed and a satisfactory steel rail assured, orders for new rails are being placed in large quantities. A notable instance is a recent order of the New York Central Railroad for 101,000 tons to be delivered during the spring and early summer. Of this order, 51,000 tons are being rolled by the Lackawanna Steel Company, 42,600 tons by the United States Steel Corporation, and the balance by the Algoma Steel Company and the Bethlehem Steel Company.

The first application in England of the single-phase current to the operation of a steam railway is that on a section of the Midland Railway from Heysham to Morecambe and Lancaster. It involves electrification of ten miles of double-track road, and the equipment consists of overhead transmission, fed with single-phase alternating current at 6,600 volts and 25 cycles. Also, a section of the London, Brighton, and South Coast Railway, nine miles in length, is being furnished with overhead electric transmission, and the total length of single track that is being equipped is 23 miles. Current will be furnished by the London Electric Supply Corporation.

A vivid impression of the huge amount of material that enters into the construction of the great bridges which are being built across the East River, may be gained by a visit to the storage yard at Bayonne, where the steel for the construction of the roadways, floors, trusses, etc., of the new Manhattan Bridge has been gathered for shipment to the site as it is needed. The stack of metal, before removal to the bridge began, weighed 30,000 tons, was 35 feet high, 85 feet wide, and 800 feet long. The steel was manufactured at Phœnixville, Pa., and it required 1,600 flat cars to transport it to Bayonne.

A recent statement made by Baron Saito in the naval section of the budget committee, at Tokio, regarding the strength of the Japanese navy, shows the absurdity of regarding that navy, excellent as it is, as a competitor on equal terms with our own navy. The active list of the Japanese navy includes 13 battleships, 12 armored cruisers, 43 other cruisers, 59 destroyers, and 69 torpedo boats. Some of the important new ships are yet far from completion. The armored cruiser "Ibuki" and the battleship "Satsuma" are to be completed this year; but the armored cruiser "Kurama" and the battleship "Aki" will not be ready until 1911.

The gain in toughness and strength of steel, due to the introduction into the construction of a small percentage of vanadium, is shown in some recent comparative tests of a carbon steel frame of 78,000 pounds tensile strength and 46,000 pounds elastic limit, and a frame of similar section with vanadium added to the steel composition. The vanadium steel frame section, carried on supports four feet apart, stood twenty blows of a 5,000-pound weight falling from a height of 18 feet, before fracture took place. The carbon steel frame section was deflected 5½ inches by the first blow and broke on the second. In the whole series of tests the vanadium steel showed about 15 per cent higher tensile strength and 25 per cent greater elastic limit than the carbon steel.

On March 9th there was laid at the Brooklyn navy yard the keel plate of the "Florida," which on the day of her launch will be the largest battleship afloat. A sister ship, the "Utah," is being built by the New York Shipbuilding Company, Camden, N. J. The "Florida," 521½ feet over all, will have 88 feet 2½ inches beam, or a few inches more than the "Mauretania." Her normal displacement will be 21,825 tons, her full load displacement 23,034 tons. She will be driven by 28,000-horse-power Parsons turbines at a speed of 20¾ knots. Her armament will consist of ten 12-inch and sixteen 5-inch guns. As a result of the economies due to consolidation of the bureaus, our naval constructors expect with this ship to make a new record for rapidity of construction.

The Brennan gyrostatic monorail was introduced to the New York public by Prof. Chessin, of Washington University, St. Louis, in the course of a recent lecture at Columbia University. Demonstrations were made with a 15-pound model running upon a copper wire. The automatic balancing mechanism consisted of two fly-wheels whose weight was 1/20 of the weight of the whole car, and the model contained all the essential features of the large car, for the development of which the British government has appropriated a large sum of money. While the car was running upon the wire, weight, which it successfully balanced, was gradually added upon one side of the car, which did not lose its equilibrium until a load equivalent to about 2/3 of its own weight had been placed eccentrically upon its platform. According to the lecturer, the gyroscope, in a full-sized car, would constitute about 5 per cent of the total weight and occupy about 15 per cent of the total space.

ELECTRICITY.

A novel desk lamp has recently been put on the market, which consists of a long glass tube in which the filament instead of being coiled is stretched out in a single horizontal line. The entire light is projected downward on to the desk by means of a semi-cylindrical reflector. The result is that the light is distributed over a larger area, and is more diffused than with the ordinary incandescent bulb.

The frequency of accidents to passengers alighting from the rear platform of one car and walking in front of a car approaching from the opposite direction, has led an inventor to devise an alarm which is sounded by the motorman when he stops his car if he sees another car coming on the opposite track. The alarm is located on the back platform, and at night the device is illuminated, so that the sign reading, "Look out for the car on the other track," may be read.

A novel telephone receiver without a diaphragm has recently been devised, for which many advantages are claimed. It consists of a permanent magnet, the poles of which are connected by a soft core, making a continuous magnetic circuit. A coil wound around this core is connected to the transmitter and a suitable battery. When the transmitter is spoken into, the undulatory current affects the entire magnetic circuit of the receiver, reproducing the voice very distinctly. It is said that with this receiver there are no overtones or disturbing sounds due to the vibrating of a diaphragm. In one modification of this telephone the sounds were produced with such clearness as to fill a large hall.

A new type of coffee roaster is now being made, consisting of an inner stationary and an outer rotating cylinder of perforated steel, between which the coffee beans are placed. The inner cylinder is electrically heated, and the beans are mixed thoroughly to provide a very even roast, by means of blades which operate in the space between the cylinders. One of the objections to the ordinary roaster is the fact that it must be opened to permit of sampling the contents, to determine when the beans have been properly roasted. In the new electric roaster a small cup is provided, which may be operated by the pressing of the knob to throw out three or four beans without stopping the cylinder, thus enabling the operator to sample the roasting.

In a recent issue of the Electrochemical and Metallurgical Industry, M. U. Schoop discusses the decomposition of water by means of electricity to provide gases used in the oxyhydrogen welding flame. The proportion of 1 volume oxygen to 2 of hydrogen is not suitable for welding metals, as the oxyhydrogen flame should have an excess of hydrogen. However, M. Schoop has found that by using acidulated water, the proper proportion of oxygen and hydrogen may be obtained. This result he achieved in experiments which had to be discontinued, and he suggests that others should take up this problem, and try it out with a view to obtaining a commercially practical system of producing directly the gases necessary for the oxyhydrogen flame.

Much has been done abroad in developing the electric furnace for refining steel. Although little has been done heretofore in this line, in this country, the decision of the United States Steel Corporation to install two Héroult electric furnaces, of much larger capacity than ever before built, shows that we have been closely watching the experiments of others, and are now ready to profit by the work they have done. One of the Héroult furnaces is to be used at South Chicago, to produce an extra fine steel for rails. The metal will be taken from a Bessemer converter, and then refined in the electric furnace. The furnace will have a capacity of 15 tons, and if it proves a success, furnaces of twice this capacity will be installed. The second Héroult furnace is to be installed at Worcester, to refine steel used in making wire. Here the furnace will be used in conjunction with the open hearth.

Another "C. Q. D." message has awakened the public to the importance of equipping all ocean-going vessels with wireless telegraph apparatus. In the case of the collision between the "Horatio Hall" and "H. F. Dimock," this importance was more strikingly shown than in the previous collision between the "Florida" and the "Republic." The passenger steamer was equipped with wireless telegraph apparatus, but the injury it received was so serious, that the operator had no time to send out any detailed information about the accident or its whereabouts. Although the passengers were taken aboard the "Dimock," considerable anxiety was felt for their safety, owing to the absence of further wireless messages. The freight boat with the passengers aboard was in a precarious condition, but could summon no assistance because it possessed no wireless outfit. Had the law been in force compelling all vessels to carry wireless telegraph apparatus, it would have been possible for the "Dimock" to communicate with the revenue cutter "Gresham," which was searching for it in the fog.

SCIENCE.

In an obituary notice of the late Mr. Ezram von Jerzmanowski we stated that he was the introducer of the water-gas process in this country. A subscriber of the SCIENTIFIC AMERICAN questioned this statement, and held that the honor belonged Mr. T. S. C. Lowe. We are informed by Dr. Arthur H. Elliott, engineer-chemist of the Consolidated Gas Company, that the credit of the introduction really belongs to M. Tessie du Motay, the inventor of the water-gas process, and that Mr. von Jerzmanowski was an assistant of his. Mr. T. S. C. Lowe modified Du Motay's process, and made it practically continuous.

Mrs. W. K. Vanderbilt's plan of building in New York city four model tenement houses for tuberculous families deserves praise. What the tuberculosis patient needs, and what he can get only in a well-conducted hospital or sanitarium, is intelligent supervision of his sleeping quarters. According to Mrs. Vanderbilt's scheme, the families to be housed in her model tenements will be thus supervised until they can safely live elsewhere. A particularly valuable feature of her plan is the fact that it tends to keep the family together. The dispersion of the family undoubtedly has its bad effect upon the patient himself, and frequently results in the separation of the entire family.

The recent newspaper announcement of the discovery by two homeopathic physicians of "Tho-rad-x," "the most powerful therapeutic agent in the world," which like all other cure-alls "will revolutionize the practice of surgery," has been made the butt of ridicule in serious medical papers. It is asserted that radium has hardly lived up to the promises which were originally held out. After all, it must be confessed that we are still much in the dark as to the therapeutical value of radioactive substances. The indiscriminate publication of such "discoveries" cannot but have an evil effect in so far as they arouse false hopes.

Capt. C. E. Thomas of Saranac Lake has discovered an opening to a great cavern on the summit of a mountain in the Adirondacks, N. Y. He penetrated the cave for about 1,000 feet, and then returned because he had no proper equipment to continue his exploration. The cave is situated on a mountain known as "W" Mountain, several miles from Standish, N. Y. The mouth of the cave is about 50 feet wide, and the first room 50 feet long, 20 feet wide, and 30 feet high. Bats lined the walls. In the second room, which was about 40 x 15 x 25 feet, ramified passages were found.

On April 9th, 1908, an inverted rainbow was seen from the Italian geodynamic observatory of Rocca de Papa by Prof. Agamennone, the director of the observatory, and a party of visitors. The morning was showery; and when the visitors reached the observatory, 2,500 feet above sea level, and looked down on the vast Campagna, they were astonished to see, projected on the vineyards and trees beneath, a perfect rainbow with its convex side down and its middle point bearing northeast. Inverted rainbows are very rare, even in mountainous regions. None of the visitors, who were French and Italian meteorologists, had ever seen one, nor had Prof. Agamennone, although he had been director of the observatory for eight years. The phenomenon, however, is not unknown. It was observed from the Eiffel Tower in Paris in April, 1891. In this case there was a double rainbow, extending above and below the horizon to form two nearly complete concentric circles.

Last July Drs. Soubris and Crouson, with the aeronaut Decugris, made a balloon ascension for the purpose of studying the cause of "balloon sickness," which has been ascribed both to deficiency of oxygen and to deficiency of carbon dioxide in the blood; Agazotti going so far as to recommend, for inhalation at great altitudes, a mixture of 13 per cent of oxygen and 87 per cent of carbon dioxide, in preference to pure oxygen. Dr. Soubris, who alone suffered from balloon sickness in this ascension, experienced six distinct attacks; of which three were relieved by Agazotti's mixture, and the others were cured, far more completely, by pure oxygen, which therefore appears preferable for inhalation. Various other observations were made during the ascension. The arterial pressure was found to vary irregularly, with the altitude and the individual. The muscular strength of two of the men diminished regularly as the altitude increased, while in the third case the strength first diminished and then increased, as the following table shows:

	Muscular Strength		
Altitude.	No. 1.	No 2.	No. 3.
0	45	57	41
13,120 feet	38	38	42
11,800 feet	42	51	39

No definite law of variation of cutaneous sensibility could be detected with Weber's compass. Bonnier's diapason also gave negative results in regard to acuteness of hearing.

IMPROVED FORMS OF THE BUGGY-TYPE AUTOMOBILE.

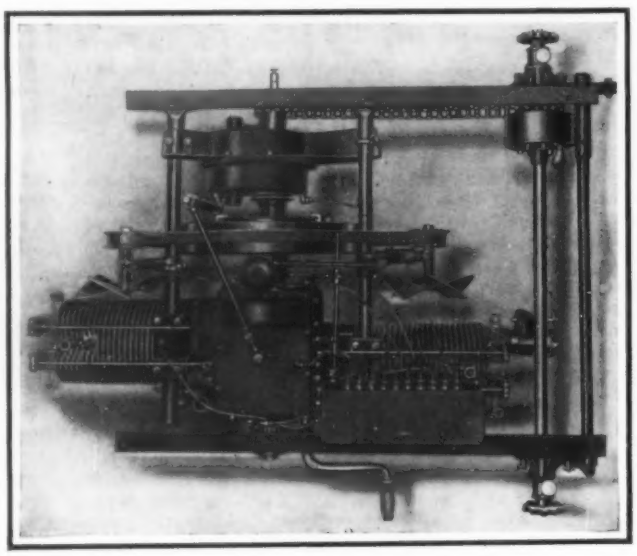
The modern motor buggy is an example of reversion to an original form, as can be seen by comparing photographs of some of the machines herewith illustrated with those of the Selden car, shown on another page. The pioneer automobile builders generally sought to place a motor upon a horse-drawn vehicle, and thus make it self-propelled, and as horse-drawn vehicles generally had large wheels, these were also used upon the first American automobiles, such as those produced by Haynes and Duryea.

Some six or eight years ago Mr. Holsman, of Chicago, reverted to the old scheme of applying a motor to a high-wheeled buggy. The machine had novel features, such as a rope drive, compact power plant, etc., and it showed itself capable of traveling over extremely bad and muddy roads with considerable facility. The use of solid rubber tires did away with all tire trouble, and in the hands of the actual user these machines gave thorough satisfaction. They were gradually improved in details and the latest change has been the substitution of a four-cylinder opposed-type motor of novel design for the double-opposed-cylinder motor that has heretofore been used. A partially-sectioned plan view of this motor is shown below. The opposed pistons in each pair of cylinders are rigidly connected, the frame that unites them having a vertical slot in which is mounted a roller bearing. An eccentric disk on the motor shaft (which takes the place of the crank) fits in this roller bearing, and the back-and-forth horizontal movement of the pistons rotates the eccentric and thus the motor shaft of which it forms a part. The up-and-down movement of the eccentric is allowed for by the roller rolling up one side of the slot in the piston-connecting frame, and down the other. There is a clearance of 1/1000 of an inch between the slot and the roller, so that it clears on the side of the slot at which there is no pressure while moving up or down the other side. The motor shaft is mounted on ball bearings and is extended outward on either side of the carriage body. At and near each end there are two V-shaped pulleys. The outermost one presses against the tires of the rear wheels and reverses the vehicle when the motor is swung backward on its two hangers. The other pulleys near each end of the motor shaft drive the rear wheels by means of a special new form of friction chain which runs over large sheaves on the rear wheels. For the low speed a positive drive is obtained by spreading the driving pulleys and allowing the chain to fall on a small sprocket at the center of each one. This is an extremely novel feature and is an excellent one, as it gives a practically positive drive on the low speed which sometimes has to be used in pulling the vehicle out of a hole. Another novel feature of this new motor is the drawing of the charge of gas into the crank case, whence it passes through automatic inlet valves in the heads of the pistons into the cylinders. By dissolving the lubricating oil in the gasoline, all the working parts of the motor are thoroughly lubricated as the charge is drawn into the crank case. The exhaust valves are located in flanged chambers on the sides of the cylinders and are operated by a slotted cam on the motor shaft, thus dispensing with all cam gears. The exhaust passes through a pipe into a muffler which surrounds the motor shaft and is entirely separated from it. The new motor has a bore and stroke of 4 inches and is rated at 26 horse-power. It is of the air-cooled type, which is the type usually employed in this class of machine on account of its simplicity and economy. It is mounted under the center of the vehicle body and is readily accessible by taking up the floor. The success that attended the Holsman machine caused others to take up the manufacture of this type of automobile, and there are at the present time fully half a hundred makers of high-wheeled buggy-type automobiles throughout the United States. Most of these conform more or less closely to the lines laid down by Holsman, though there are some variations in the form of drive and of motor used. For instance, in the McIntyre machine, and also in the International, the double-opposed air-cooled motor has a planetary two-speed transmission mounted directly upon the crankshaft and arranged to drive a countershaft, placed at the rear, by means of a single chain. The final drive to the rear wheels is by double chains from the ends of this countershaft. A good idea of this arrangement is to be had from the plan view of the power plant of the International automobile buggy. In this case special fans are arranged to blow upon the exhaust valve chambers and keep them well cooled, while the lubrication is effected by means of a mechanical oiler positively driven from the motor crankshaft. A powerful 5 x 5 opposed-cylinder motor of 14 brake-horse-power is used in this car. The motor is mounted upon a steel sub-frame, and its location in the center of the vehicle makes an equal distribution of weight. The body is mounted upon four full-elliptic springs 3 feet in length. The wheels are 40-inch diameter in front and 44 in the rear, and they are fitted with special flat-tread solid rubber tires of 1¾ inches diameter. Internal expanding brakes are fitted in the sprocket drums.

The McIntyre machine has a motor of 4⅛ x 3¾ inches bore and stroke, rated at 12 to 14 horse-power. The wheels are fitted with 1¼-inch solid rubber tires and contracting ring brakes are used on the driving wheels. The front and rear wheels are 34 and 38 inches in diameter respectively. This concern has recently brought out a large four-passenger automobile with a four-cylinder vertical motor placed in front under a bonnet and with shaft drive through a two-speed planetary transmission to the rear axle. The motor used on this car has the same bore and stroke as the other and is rated at 28 to 32 horse-power. The use of solid tires on a large car of this kind necessarily limits the speed at which it can be regularly driven to not much more than 20 miles an hour; but for certain purposes the solid tire is preferable on account of its reliability and freedom from puncture.

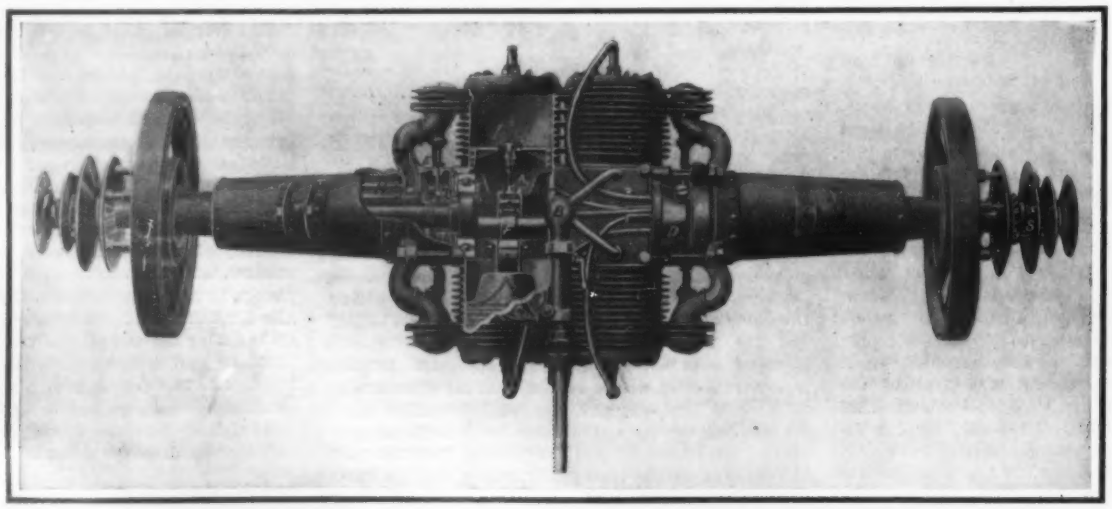
Still another variation in the power plant of the medium-priced buggy-type machine is to be found in the Schacht runabout, in which a water-cooled double-opposed-cylinder motor is mounted transversely in the box at the rear of the body and is arranged to drive, by means of a composition alloy metal disk attached to its flywheel, a paper-rimmed wheel mounted upon a countershaft forward of the motor. This wheel contains a differential in its hub—a feature that is necessary in order to allow a difference in speed of the driving sprockets on the ends of the countershaft when the vehicle makes a turn. The drive to the rear wheels is by two side chains. The radiator used as a dashboard is a novel feature of this machine.

One of the simplest buggy-type automobiles yet devised is the "Buggyaut" of the pioneer automobile constructor, Mr. Charles E. Duryea. This machine is fitted with a two-cylinder, two-cycle, air-cooled motor of about 12 horse-power. The bore and stroke of the cylinders are 3¾ inches respectively. The motor is mounted in a horizontal triangular frame the base of which is formed by the extensions of the motor crankshaft through suitable casings. These tubular casings contain spiral pockets, *A*, and flanges upon the motor shaft extensions fit in the pockets. By rocking the tubular casing the shaft extensions are thus moved sideways and the two grooved pulleys at their ends are brought opposite the grooved rings on the wheels to obtain the low or high speeds. The frame containing the motor is then swung forward until the pulleys are brought into mesh with the rings sufficiently tightly to drive them by friction. The drive is similar to that of a locomotive upon rails, except that in this case the rails are round and grooved, thus making greater frictional contact and lessening the pressure required. The pulleys are made of steel, and the rings, which can be readily and cheaply renewed in a few minutes after they have worn out, are also of this material. Both the large rings and the larger of the two driving pulleys are made up of separate beveled circular pieces. A smaller ring with external grooves is used for the reverse. The bearings of the motor are large and are lubricated by grease cups. The cranks and pistons are lubricated by the feeding of oil with the gasoline, which system was introduced last summer by Mr. Duryea. The forward end of the triangular frame containing the motor is connected with the steering post, so that when the front wheels are turned in one direction or the other, the motor is moved slightly sideways and the friction upon the innermost driving-wheel ring is reduced, thus allowing the pulley to slip when the difference of speed occurs in turning a corner. The flywheel, *F*, is fitted with notches into which a lug on the starting spring, *S*, slips. A cord on the front end of this spring runs forward and over a pulley up through the floor. By pulling the handle on the end of the cord the motor can be turned over and started from the seat. A starting crank can also be used on one end of the motor shaft extension if desired. The two-cycle motor is by all odds the simplest and most reliable type, and when this is made air-cooled (as it is in this case by means of special copper heat-radiating flanges of great conductiv-



Power plant of the International motor buggy.

This is a typical power plant having an air-cooled double-opposed-cylinder motor with offset cylinders and all mechanically operated valves, direct-connected to a two-speed-and-reverse planetary transmission a single chain from which drives a countershaft carrying a differential. Two chains from the end of this countershaft drive the rear wheels. A novelty is the two fans ingeniously driven by a belt passing under and over the flywheel. The motor is thoroughly lubricated by a mechanical oiler having ten outlets.



The twin opposed-cylinder engine and driving mechanism of the Holsman motor buggy.

The motor has novel features such as eccentric disks, *F*, on its shaft instead of cranks; inlet valves, *I*, in the pistons; and exhaust valves, *E*, operated by special grooved cams without gears. The pistons are connected together by a rigid frame and the eccentric disk works in a slot in same in a roller bearing, *A*. *C* is the carbureter and *B* the manifold connecting it to the crank case, into which the charge is drawn. The exhaust passes through the exhaust valves into mufflers, *M*, surrounding the extensions of the motor shaft. *D* is the distributor from which the wires run to the spark plugs. The power plant is hung upon two rollers. Note the expansible pulley with sprocket, *S*, for the low speed.

SOME TYPICAL MOTOR-BUGGY POWER PLANTS.

ity), and fitted with the simple lubricating arrangements that are used on such motors of the marine type, an engine of long life and simplicity and excellent wearing qualities is produced.

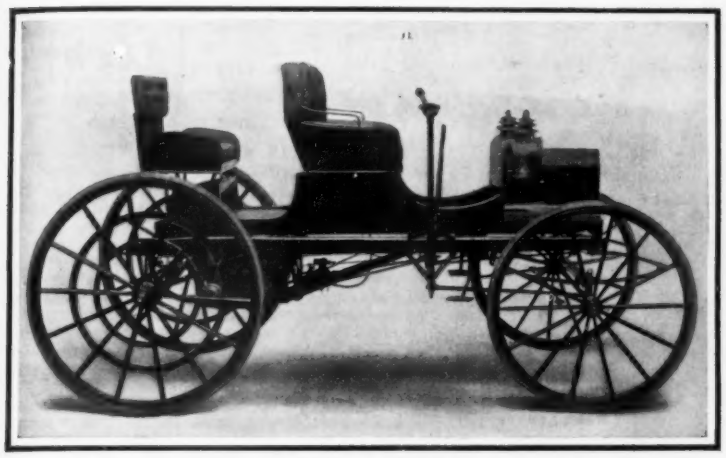
Another machine which resembles an ordinary automobile closely as far as the power plant is concerned is the "Simplo." This machine has a double-opposed-cylinder motor mounted in front under a bonnet. The motor is either of the air-cooled or water-cooled type. The longitudinal driving shaft, *S*, (see illustration) extends back from the motor to the middle of the frame and carries on its end a cone, *C*, of impregnated fiber, which is mounted to slide upon it. On a transverse countershaft there are slidably mounted two beveled disks, *FG* and *RG*. One of these disks, *RG*, is used for the reverse, while the other one, *FG*, gives the forward speeds. As the cone *C* is moved forward by means of a hand lever, the beveled disk *FG* is slid upon its shaft so that it is kept in close proximity to the cone. Contact is obtained by pushing the two together by means of a pedal, whereupon *C* drives *FG*, which in turn drives the live rear axle through its shaft by means of a single chain. As the driven disks are of metal and the driver *C* of paper, any wear caused by slipping does not wear uneven places upon the paper pulley, as generally happens when this is the driven member, which it usually is in most friction-disk transmissions. The principal point about the cone-and-beveled-disk transmission is that the entire friction surface of the two members is in good rolling contact and that there is no difference in speed between the two edges of the driven disk, with the consequent slippage that necessarily occurs with the usual type of flat friction-disk transmission.

To give some idea of the cost of maintaining and operating an automobile of the high-wheeled, buggy type, we append some figures obtained from a physician in a New England city, who has used one of them constantly for the past three years. The machine was in almost constant use about town and long trips were occasionally made with it into the country over roads that were none too good. The average cost per month for a period of 32 months was $38.31, which was distributed as follows:

Tires (8 at $8 each, requiring one hour to put on)	$2.00
Storage (machine kept in garage first year)	4.50
Oil	1.72
Gasoline	6.11
New parts (cables $15, chains $24.50, coil $42, sheaves $11.20, batteries $10, spark plugs $12, muffler, $6.75)	3.79
Overhauling (including painting once in 32 months)	9.00
Labor	9.19
Substitute vehicle during repairs	2.00
	$38.31

The machine referred to traveled an average of 20 miles a day and gave its owner satisfaction. The total cost of $0.06 a mile for the 20,000 miles it has been operated is about one-quarter the cost of running a pneumatic-tired automobile; and this could doubtless be considerably reduced in many instances.

In addition to the runabouts illustrated herewith, most manufacturers now make surreys and other forms of four-passenger rigs upon the same general lines. They have also entered the commercial vehicle field, and delivery wagons that can be quickly converted into passenger vehicles after they have been used for business are now on the market. The farmers of the middle West are rapidly coming to appreciate the advantages of this type of machine, and many of them are using it in place of horses. Such a convertible rig can be used to haul produce to market, and afterward to give the family a ride at the end of the day's work. It will traverse bad roads and is very serviceable.

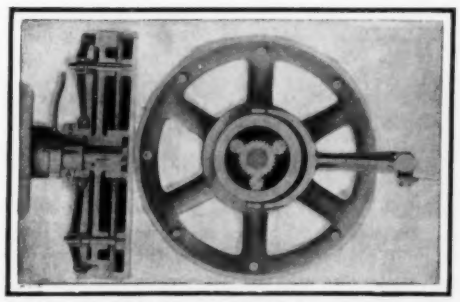


Duryea "Buggyaut" with extra foldable seat in the rear.

The simple friction drive direct from the pulleys on the ends of the motor crankshaft to the rings on the rear wheels is apparent in this photograph. The steering is done by a lever and the motor is throttled by twisting the steering handle.

The McIntyre motor buggy—a typical machine of this kind.

This machine has a 10-11-horse-power, 3¾ x 3¾ double-opposed-cylinder motor, planetary transmission, and double side chain drive from a countershaft. A regular automobile steering wheel is used.



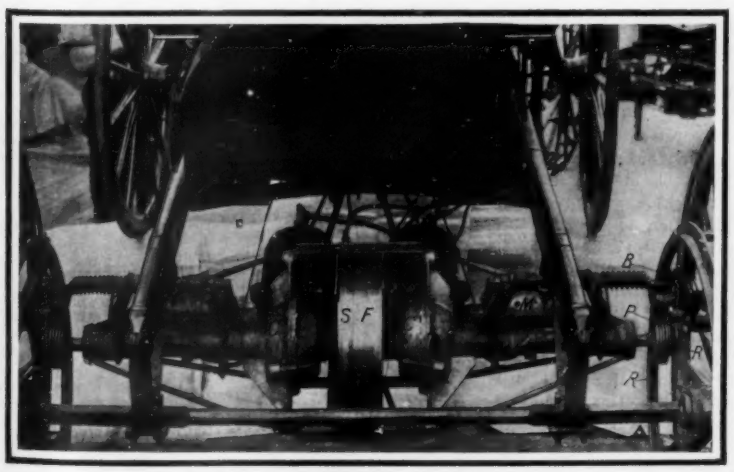
Disk transmission of the Schacht motor buggy.

The large wheel with the differential gear in its hub is slid over the face of the disk attached to the flywheel in order to obtain the different speeds.

honey are discussed, including the relations between honey and honey dew, gums, and other vegetable secretions, and the effect of artificial feeding of bees on the composition of the honey produced by them. The composition of honey dew, and floral nectars, and the methods by which they are transformed, "inverted" and preserved by the bees are described, and analyses are given of 100 specimens of honey, produced from 50 varieties of flowers in 32 States. The investigation includes both optical methods (direct polarization, polarization by inversion, estimation of levulose by Wiley's process) and chemical methods (determination of water, sugar, reducing sugar, ash, dextrine, free acid). The article also gives data concerning the adulteration of honey with cane sugar, invert sugar, and syrup made from starch, and methods of detecting such adulteration.

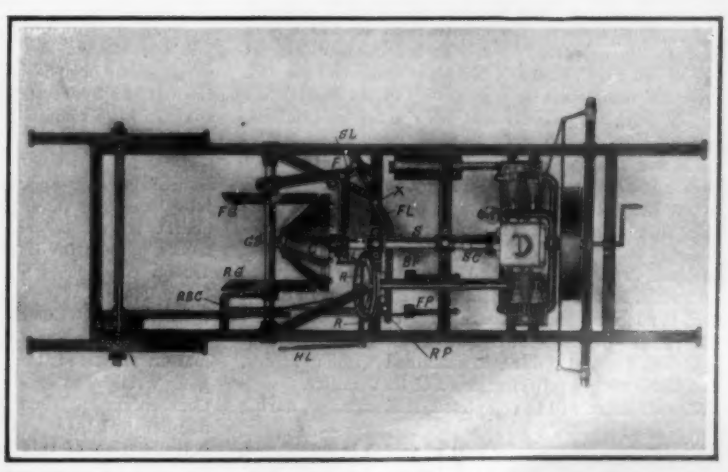
Death of Major E. L. G. Zalinski.

Major Edmund Louis Gray Zalinski, well known as the inventor of the dynamite gun which bears his name, and which was installed upon the "Vesuvius," died on March 11th in New York city. Major Zalinski was born in Kurnich, Prussian Poland, on December 13th, 1849, and came to this country when he was four years of age. During the civil war he served as an aide to Gen. Nelson A. Miles, and later entered the regular army. Between 1883 and 1889 Major Zalinski became widely known as an inventor of military devices and as an investigator of explosives. He was best known for his development of the pneumatic dynamite torpedo gun, which however never attained the widespread use that he hoped.



The power plant and driving mechanism of the Duryea "Buggyaut."

The two-cylinder air-cooled two-cycle motor has slidable extensions of its crankshaft carrying on their ends large and small grooved pulleys, *P*, which friction against the large grooved rings, *RR'*, for the forward and reverse motion. *B* is the brake shoe. The crank cases of the motors are shown at *CC*; *F* is the flywheel between the two; and *S* the starting strap for starting the motor from the seat. The mufflers are shown at *MM*. *AA* indicate the spiral grooves in the crankshaft casing which, when the casing is rocked, cause the shaft extensions to move sideways and bring the small or large pulley opposite the ring for low or high speed.



Plan view of chassis of "Simplo" runabout.

S, Extension of motor crankshaft carrying conical driving disk, *C*. *FG*, Beveled disk meshing with *C* for forward drive. *RG*, Reverse drive disk. *GS*, Countershaft. *HL*, Hand lever for operating disks and cone *C*. *FP*, Pedal for bringing disks and cone in contact. *BP*, Brake pedal. The cone and beveled disks, which are used in place of the usual flat disks shown above, have several distinct advantages which will be found described in the text. This car is different from most of its kind in that a live rear axle is used and also in the placing of the engine in front under a bonnet.

SOME NEW MOTOR BUGGIES AND THEIR POWER PLANTS.

THE SCHNEIDER TORPEDO-LAUNCHING STATION.

The Schneider Company is completing a structure of a novel and unique character for the launching and regulation of the automobile torpedoes which it constructs for the French navy. The mechanism of these torpedoes is very intricate and delicate, including a four-cylinder motor, an auxiliary motor for steering, many pipes, valves, and cranks, and a system of gearing by which power is transmitted from the motor to the twin screws.

In addition, there is the ingenious regulating mechanism, including a clock, a hydrostatic piston, and a gyroscope, by which the vessel is held rigidly to the prescribed course and depth of immersion.

All of this machinery is contained in a hull 23 feet long, a large part of which is occupied by the compartment containing the compressed air by which the motors are driven.

It is easy to understand that the assembling of all these delicate organs is a difficult task. It is necessary to co-ordinate the movements of the various parts and to regulate their action until the torpedo can be relied on to pursue a perfectly straight course.

The regulation is effected by making infinitesimal changes in the positions and motions of the rudders, the clock, and the hydrostatic piston, the adjustment being determined half by theory, a quarter by practical experience, and the remaining fourth by trial and error. The regulation involves a number of launchings and trial trips, which must take place under certain favorable conditions. It is necessary, above all, to select a sheltered spot, where still water can be found even when the sea is rough, and where the torpedo can accomplish its full range, about 2½ miles, without risk of encountering vessels or other obstacles or a depth of water less than 50 feet. The trial ground must also be situated near a seaport and a railway, and it must have attached to it structures suitable for the preparation, regulation, and launching of torpedoes.

A site offering the conditions requisite for an establishment of this sort is not easily found. The company thoroughly searched the Atlantic and Mediterranean coasts of France before it found a suitable location, in the fine roadstead that extends between the Hyères islands and the Mediterranean shore, near Toulon. Even this site has the defect that a depth of 50 feet is not found sufficiently near the shore to make it practicable to erect the required buildings on land. Torpedoes are usually adjusted to travel about 12 feet below the surface, but as they are launched from a considerable height they go much deeper at the first plunge and make several oscillations upward and downward before they become definitely established at their normal level. Hence it is necessary to have a considerable depth of water in order to avoid all danger of striking the bottom, and a depth of 50 feet is deemed requisite.

Under these conditions the company decided to construct, at the point where this depth is found, and whence the course extends seaward, nearly at right angles to the shore, an artificial island to support a building containing all the appliances required for regulating and launching torpedoes.

This ingenious project is now accomplished and the tourists and fishermen see a many-windowed building, resembling a commodious dwelling, rising 30 feet above the water and apparently resting on it, 800 feet from the shore. The building is made entirely of armored concrete. It was designed by the engineers of the Schneider and Hennebique firms, in collaboration, and constructed at the shipyard at La Seyne, 20 nautical miles distant from its present site. The lower part of the structure is a huge caisson with slightly inclined walls. This caisson, the construction of which was commenced in March, 1908, was launched in August like an ordinary vessel and remained afloat two months. After its completion it was towed to its destination by two tugs, very slowly and with many precautions, on a calm, still night, early in November. The emplacement had been prepared by divers, and a carefully leveled bed of stone, about 12 feet thick, had been laid on the sea bottom. The caisson was moored very exactly over this foundation and gradually sunk by admitting water into compartments designed for that purpose. These difficult and delicate operations were performed in exceptionally favorable weather and with perfect success. A few hours after the floating island had become a fixed one it was exposed to the fury of a violent tempest, which it sustained without injury, and thus gave a gratifying proof of its stability.

The structure will be completed, it is expected, during the present month.

The caisson, the greater part of which is submerged, terminates in a platform 11 feet above mean sea level. It is almost a solid mass of concrete, but contains a subaqueous water-tight chamber, in which are placed tubes for launching torpedoes under water. These tubes project through the wall of the chamber, and are fitted with water-tight joints. Their outer ends are surrounded by a lock, which, when closed and pumped dry, permits examination and repair of the tubes and their doors. At and above the water line, the caisson is protected by wooden fenders from injury by vessels, torpedoes, and other floating objects.

A two-story building is erected upon the platform. The lower story contains tubes for launching torpedoes above the water level and is connected with the chamber beneath by a large opening in the floor. After each torpedo has finished its course it will be picked up by a vessel, brought back to the station, hoisted to the platform by tackle running on a concrete beam and received in a large recess in the first story, whence it will go to the regulating and repair room for further adjustment. All the hoisting, conveying, and other machinery, including a series of railways, a pump for emptying the subaqueous chamber, and air compressors for charging the torpedoes, will be operated by electricity furnished by two generators, driven by petroleum motors.

The upper story of the building will contain offices, lodgings for caretakers, and an observation room placed directly over the launching tubes, and supported on cantilevers outside the wall of the building. This room will have a bay window with a glass floor, so that the moment at which the torpedo leaves the tube can be noted, for the purpose of determining the velocity. The observation room will be surmounted by a signal tower from which communication can be held with observers stationed on floats at various points of the course.

The Amateur Wireless Operator.

Some time ago, when the fleet was on its last lap of the famous around-the-world trip, trouble was experienced by the operators of several naval wireless shore stations scattered along the Atlantic coast. Complete messages could not be received by these stations, because amateur wireless operators would interfere. Their periodicity was nearly the same as that of the ships of the fleet, that is, 425 meters wave length, and many of them have as strong a sending apparatus as the ships.

Take Washington, D. C., for instance. There are at least fifty well-equipped stations. Their operators range from twelve to fifty years of age. They may not be able to send as far as the naval station, but when it comes to receiving, they get everything that is in the ether. Many of them at times hear distant stations calling the navy yard, and when no answer is heard, these young operators then call the naval station, and report that a distant station is calling them. It is claimed that the operators on watch never respond to these favors, and go on with their regular business. It certainly seems as though the naval operators were not appreciative.

Complaints are sent in every day at the Navy Department. If this continued interference keeps up, the wireless amateurs will get themselves into trouble. Two plans to regulate these youngsters are under consideration. One is to limit them to certain hours of the day, when they can do their talking. The hours most likely to be adopted will be from 3:30 to 7. Another plan is to license these stations, as they do over in England.

About a year or so ago, a high school student, who had a wireless station, thought he would have some fun by sending fake messages to the navy yard and sign the "Dolphin." The operator on watch later caught the guilty offender. A report of this occurrence was immediately made to the Navy Department, which referred the matter to the District Attorney. It was found that nothing could be done with the young man, who promised to "be good" when it was explained just what damage his mischievous pranks with wireless might do.

The Current Supplement.

A new method and a machine for degreasing wool continuously are described in the opening article of the current Supplement, No. 1733. Dr. Robert Grimshaw exposes some wire-nail fallacies. Prof. Reginald Fessenden's paper on Wireless Telephony is continued. John S. Fielding writes on "Safety Factors in Dams." San Francisco's new fire-protection system is exhaustively described. Brimming with many a quaint bit of historical information is Franz Feldhaus's "Submarine Experiments of the Past." A. E. H. Tutton contributes an excellent paper on the Crystallization of Water. In a paper entitled "The Untilled Field of Chemistry" Arthur D. Little dwells on the stupendous stores of potential energy bound up in matter. In 1885 the distinguished physicist Helmholtz wrote a paper entitled "Theoretical Speculations Concerning Dirigible Balloons." For the benefit of aeronautical inventors we publish in the Supplement a translation of this paper.

Magnesium is now being employed to some extent as a deoxidizer in brass manufacture, having the advantage over phosphorus that an excess may be used without harm, and, indeed, may improve the quality of the brass. Magnesium is a metal which belongs to the same family as zinc. Ordinarily the addition of 0.05 per cent of magnesium to the brass is sufficient for deoxidizing purposes.

Correspondence.

GENERAL FORMULA FOR COMBINATIONS OF NUMBERS.

To the Editor of the Scientific American:

I was much interested in Dr. J. G. Bland's letter in the issue of February 13th, as I had made some researches in a similar direction. I was seeking combinations of numbers that would bring any finite results in problems illustrating Euclid's proposition No. 47, Book I.

In the (Boston) Journal of Education of September 5th, 1907, and April 2nd, 1908, appeared communications from me bearing on this.

I would now submit an equation in harmony with which must be all problems, which secure finite results, illustrating this proposition:

$$(ln)^2 + \left[l\left(\frac{n^2}{2m} - \frac{m}{2}\right)\right]^2 = \left[l\left(\frac{n^2}{2m} + \frac{m}{2}\right)\right]^2$$

Frank Jerome, Sr.

Boston, Mass.

ACCURACY IN SCIENTIFIC DICTION.

To the Editor of the Scientific American:

Prof. S. A. Mitchell's article in the Scientific American of February 6th contains a number of inaccuracies that should not pass unnoticed.

First, the extremely loose way in which the terms "temperature" and "heat quantity" are used is to be deprecated. It should be remembered that the thermometer measures temperatures, and that such terms as "degrees of heat" have no meaning.

In explaining the action of the thermopile Prof. Mitchell says: "When heat strikes a thermopile it alters the resistance offered to an electrical current passing through it, and this change of resistance is measured by the galvanometer." The most elementary text-book shows that the action of the thermopile is nothing of the sort.

Further on we find: "Where the strength of the solar heat is the large number 10,000,000 that of the moon (i. e., reflected solar radiation) is only 12; or in other words the sun shines with an intensity 800,000 times that of the moon." It would be pleasing to learn what justification there may be for the term "strength" as applied to solar heat. This sentence, however, commits the graver fault of treating two distinct propositions as identical. It may be that the sun shines with an intensity 800,000 times that of the moon, the comparison being made with the photometer, but when the total radiations of the two bodies are compared the ratio is about 180,000 to 1, and the latter is the ratio here involved, as nearly as I can make out.

What is meant by the "intensity of the corona at 1.5 millimeters from the sun's limb," etc.? We may guess that Prof. Mitchell means the rate of radiation of the corona at the above-mentioned distance from the edge of the solar image (size not specified) given by his particular apparatus, but as the language stands it really means nothing at all. It is an extremely dangerous practice to use scientific terms in other than their exact and accepted signification.

C. C. Hutchins.

Bowdoin College, Brunswick, Me.

FROM THE TRACK-WALKER'S STANDPOINT.

To the Editor of the Scientific American:

The unveiling of disagreeable facts sometimes helps to needed reforms. In a late editorial you bore down heavily on the antiquated railroad spike as out of place in the modern American roadbed and track, and only fit for a museum of railroad antiquities; at the same time commending the general excellence of the best modern American roadbed and track.

I venture the assertion that there is as little of such bed and track in proportion to the whole as there is of the best American highway.

The locomotive is said to be the most perfect and useful or satisfactory machine that man has made, and the ordinary wheeled vehicle, to say nothing of the automobile, has also reached a high state of perfection. Yet they both run upon roads that in general are full of defects.

In all the controversy between the railroads and the railmakers over the weakness and imperfections of the rail, the railmen have always acted upon the defensive, whereas they might well, and with perfect safety, have carried the war into the camp of the enemy. Rails are sometimes defective, it is true, but the treatment they receive, and the abnormal strains to which they are subjected and in the main endure without injury, entitle them to be called one of the very best products of the American manufacturer.

The rail as delivered to the consumer is a straight piece of steel, and is intended to lie flat, with more or less rigid connections, upon a comparatively unyielding surface. It is actually placed upon a bed almost as yielding in proportion as the packed soil of the ordinary highway yields to the carriage wheel. In most cases it very soon assumes a bent condition, usually lowest at the joints, and in many cases very much depressed, so that in looking along the line from a little above its level, it seems to be made up of arcs of circles. These are short in perspective, and so they are in the rapid transit of heavy wheels over them, making the shock of impact very abrupt. Moreover, they do not lie still, but a wave of depression passes along them as the wheel advances. In a short time, as you say, the vertical motion has loosened the spikes, and the depression at the joints increases. How hard it is to make a level joint appears from the fact that on many bridges and trestles where the foundation is timber and not soil, this joint depression is plainly to be seen.

In the electric traction experiments at Berlin, it was found that high speed was so destructive to the track, that an entirely new system of road building had to be devised. It may come to this for the use of our fast and heavy locomotives before safety can be assured. The imperfections mentioned would seldom be noted by the unpractised eye from the level of the car, but from the level of the trucks they are only too apparent.

I have repeatedly watched the great depression at the rail joints from the passing of locomotives on good track and away from stations. In one instance, five heavy mountain engines coupled together passed me between stations on a road accounted one of the best. The rails not only bent deeply at the joints, but the ties away from the joints seemed to move freely up and down in the ballast. The ballasting, though apparently of the best, was too coarse, so that it did not hug the ties, and a large proportion of the spikes did not bind the rails to the ties. Though the curves were short here, and the grades heavy, there was no lateral bracing of the rails to insure their standing up, and I was told that accidents on this part of the line were of frequent occurrence. And here was in use a heavy, wide, tie plate, which practically covered the full width of the ties, whereas the ordinary tie plate, as I have seen it, is so narrow as to afford but little more bearing than the rail itself. Section men say that the short life of the tie is owing not so much to decay as to the cutting occasioned by the pounding of the wheels. How necessary, then, to employ a tie plate with a wide bearing on the tie.

On at least one great transcontinental line, the tie plate, so essential in preventing lateral movement also, is conspicuous by its absence; and this line boasts some of the heaviest locomotives in use. I noted also along this line piles of ties just removed and awaiting the torch, which seemed to be but masses of splinters and decay, so long had they been kept in the ground.

On another line I saw one place where the shattered ties, four or five together, afforded but little support for six or eight feet of rail. And no doubt it is in such places as this that the rails spread, as certainly there is little to hinder. One fast train which I failed to catch, I was later interested in learning, was ditched while running at good speed on straight track, by spreading rails.

No doubt individual pieces of track show care, or the want of it, on the part of the section boss, but the lack of tie plates, and of lateral bracing on curves, indicate a defective system.

I saw two rails, opposites, in which only two spikes at each end of the rail were driven home, the section men evidently having been called off to other work. All the rest were started only, and stood from one to three or four inches above the rail base. This condition lasted for forty-eight hours on a main line where there was an average of a train an hour, many of them fast and heavy express trains. It was invitation to disaster, and yet had a derailment and wreck occurred, who even of the officials would have suspected the cause?

On one electric line I watched for many miles a new curve. The usual joint depression was marked, but in addition the rails were spread at the joints, where they were highly polished by the pounding of the wheels, while on the apex of the curve the wear showed only on the inner half of the rail face. While high speed was made on this road, its roughness appeared from the fact that it was difficult to keep one's seat without bracing the feet. The rails were comparatively light, and more readily responsive to the inequalities of the roadbed.

I think these observations go to show not only the remarkable endurance of the American rail, but the need of a better bed for it to lie on, not only for its own life, but for that of the traveler.

Chicago, Ill. GEORGE S. PAINE.

THE LOCUST TREE: AN IMPORTANT FIELD FOR INVESTIGATION.

To the Editor of the SCIENTIFIC AMERICAN:

The locust is one of the most valuable trees growing in the United States. In common speech we have the black, yellow, and honey locust. The botanists recognize the false acacia, or *Robina pseudacacia*, and the *R. Lispida*. The wood has a strength as great as or greater than any of our native woods. Its only rival in common use is the hickory. The latter, however, is not nearly as strong. Hickory has the one advantage of being much more elastic. The locust resists crushing in experiment to the extent of 9,800 pounds, and its tensile strength is put at 18,000 pounds per square inch. The wood is almost insensible to decay, and lasts under water like white pine, which is in that position indestructible. Its great tensile strength and durability caused its universal use for treenails in wooden ships. No other wood ever took its place for this purpose.

The insensibility of the wood to decay appears to be due to some form of pitch or waterproof varnish within the wood. It seems to the casual observer that there was some chemical combination with the cellulose itself, which rendered it immune from the action of water. Even a locust post seems perfectly indifferent to decay at the surface of the ground.

Since the cellulose of the locust seems not to be different from that of other trees, the importance of a chemical investigation, which shall discover the secret of its remarkable and valuable characteristics, can at once be seen. The discovery of some means of converting ordinary cellulose into a compound having the same properties as that of the locust would be simply invaluable in the arts. If merely a method of imparting its waterproof qualities to the cellulose of the spruce, for example, could be discovered, it would result in the creation of a new and gigantic industry, perhaps several.

An investigation of this subject opens a wide field to the young man. Its importance and value can hardly be overestimated.

It will be interesting to note the fact that the finest, strongest, and most desirable locust timber in the United States is said to be found on Long Island. It is also said that the tree grows more rapidly there than anywhere in the country. From the so-called annual rings, it appears to be one of our most rapidly-growing trees. Owing to the extreme hardness of the timber, it does not promise to be a favorite with lumbermen. It is somewhat surprising that the locust is not more frequently recommended for railroad plantations.

B.

WHAT IS THE SELDEN PATENT?

BY CHARLES B. HAYWOOD.

Although manufacturers' organizations, formed as the result of differences of opinion concerning its validity, have done a great deal to spread knowledge concerning it and have greatly emphasized its importance, much confusion exists in the public mind as to just what the so-called Selden patent is. Exactly what its claims cover is something of which even the majority of well-informed motorists have but the haziest conception. Probably the one thing that is generally known regarding what bids fair to make for itself a niche in American patent history, as lasting as that of the Bell telephone, or McCormick reaper litigation, is that there are a certain number of manufacturers who acknowledge the validity of the Selden patent and pay royalties under license; likewise that there are others who refuse to part with even the small percentage of their profits now demanded as tribute. Originally the royalty paid by the licensees to the owners of the patent was 1.25 per cent. A reduction to 1 per cent was afterward made by the owners of the patent, voluntarily, as the volume of business increased. Subsequently, owing to the refusal of several of the licensees to pay the royalties at the old rate to the receivers of the Electrical Vehicle Company, the owners of the patent, a petition, filed by the licensees, was granted by the Federal Court for a reduction in the amount of royalty from 1 per cent to 0.8 of 1 per cent.

It is also generally known that the two trade organizations in question have been formed for the mutual protection of the interests of their members; one to uphold the Selden patent, hold automobile shows, and generally advance the welfare of its supporters by various means, such as the maintenance of a laboratory, an engineers' department holding monthly meetings, and the like; the other to fight the patent, its objects otherwise being the same as the first, though it has not developed them to the same extent as yet. These are respectively the Association of Licensed Automobile Manufacturers and the American Motor Car Manufacturers' Association, generally known as the Licensed Association and the Independents. Each holds an automobile show in New York annually. In Chicago, they sink their differences for the time and exhibit together simultaneously. This serves to sum up the extent of general knowledge on the subject. It may be added here that there are other manufacturers, of no small importance, who acknowledge the standing of neither association by holding aloof from both. Needless to add, they pay no royalties.

The Selden patent was granted to George B. Selden, of Rochester, N. Y., November 5th, 1895, and is known in the United States Patent Office files as No. 549,160. The application for patent rights was filed sixteen years earlier, or on May 8th, 1879. The subject of the patent is set forth by the applicant as an "Improved Road Engine," while its chief advantages are stated as "the elimination of the great weight of the boiler, engine, water, water tanks, the complicated apparatus necessary to adapt the machine to the roughness of the roads which it must traverse, the necessity of a skilled engineer to prevent accidents, and the unsightly appearance of locomotives built on this plan."

Parts of the specifications upon which the inventor and the Licensed Association found their appeals to the courts to sustain the basic nature of the Selden patent, are as follows: "I have succeeded in overcoming these difficulties by the construction of a road locomotive propelled by a liquid hydrocarbon engine of the compression type, of a design which permits it to be operated in connection with the running gear . . . very largely reducing the weight of the machine in proportion to the power produced, and which enable me, while employing a most condensed form of fuel, to produce a power road wagon, which differs but little in appearance from, and is not materially heavier than the carriages in common use, is capable of being managed by persons of ordinary skill at a minimum of trouble and expense, and which possesses sufficient power to overcome any ordinary inclination. Any form of liquid hydrocarbon engine of the compression type may be employed in my improved road locomotive. As the general mode of construction and operation of liquid hydrocarbon engines of this class are now well known, it is considered unnecessary to further describe them here.

"The traction wheels are attached to the axle by clutches, splined on the driving shaft and held in mesh by springs in order to permit of the wheels rotating independently of each other to facilitate progress over rough roads and the turning of corners. These clutches may also be used for the purpose of disconnecting the engines from the traction wheels. Friction or ball clutches may be used for this purpose. Provision is made for backing my improved road engine by reversing the motion of the driving wheels by a set of reversing gears . . . a clutch is interposed between the engine and the driving wheels so as to admit of running the engine while the carriage is stationary."

Selden accordingly made the following claim:

"The combination with a road locomotive, provided with suitable running gear, including a propelling wheel and steering mechanism, of a liquid hydrocarbon gas engine of the compression type, comprising one or more cylinders, a suitable liquid fuel receptacle, a power shaft connected with and arranged to run faster than the propelling wheel, an intermediate clutch or disconnecting device, and a suitable carriage body adapted to the conveyance of persons or goods, substantially as described."

It will be apparent from this that the patent granted to Selden accordingly covers every one of the fundamental essentials of the gasoline automobile of the present day—the internal-combustion motor working on a compression cycle, a clutch or means of disconnecting the road wheels from the engine, the latter being designed to run much faster than the road wheels, and a means of reversing by a gear train. The differential principle of driving the wheels was also involved, but this has no bearing on the patent. Evidently, if Selden's claims can be substantiated, they are basic, and enormous royalties may be collected. It all hinges upon whether or not Selden was anticipated by other investigators in the same field, or as the legal phraseology of the Patent Office has it, whether there is anything in the "prior art," which would render his claims to originality entirely unfounded.

Apparently, this is rather a simple question and it has been settled times without number, both *pro* and *con*, by automobile enthusiasts, who are willing to pass unequivocal judgment in accordance with their own views without the slightest hesitation. Thus far, however, it has consumed nine years of litigation, almost half a million dollars, and 60,000 folios of testimony to provide the courts with something upon which to base a decision, and this has yet to be rendered. The life of the Selden patent comes to an end, November 5th, 1912, and there is at least a doubt as to whether the question of its validity will be finally settled before it legally expires. It has been considered in automobile circles that this is somewhat of an exceptionally long-drawn-out instance of patent litigation, but the telephone, reaper and binder, and the sewing machine furnish parallel cases that greatly exceed it, these landmarks in our patent history having been in the courts throughout practically the entire terms of their legal existence of seventeen years.

As early as 1899, George Day, then president of the Electric Vehicle Company, became convinced of the value of the Selden claims, and his company accordingly acquired a controlling interest in the patent. The company in question, which is now operating in the hands of a receiver, was then making gasoline as well as electric vehicles, and in 1900 it undertook the task of enforcing its right by bringing an action against the Buffalo Gasoline Motor Company, and the Automobile Fore Carriage Company (it was always Selden's idea to drive the forward wheels) as infringers. Half a year later, another action was instituted against the Winton Motor Carriage Company, which was one of the first concerns in this country to market gasoline-driven vehicles on any scale. About two and a half years then passed without any developments of note, and then George Day, having resigned as an official of the Electric Vehicle Company, undertook the organization of the Association of Licensed Automobile Manufacturers. It was on March 10th, 1903, that the association came into existence with ten American manufacturers of automobiles as charter members. The litigation against the Buffalo and Winton concerns was then amicably terminated by the defendants agreeing to become members of the association and to pay royalties. A number of minor actions in the shape of petitions to the federal courts to enjoin the use of imported vehicles were brought against individuals and importing companies about the same time, with varying results. One or two were allowed to go by default through the defendant's failure to appear and contest the case, and injunctions obtained under such circumstances were exploited as evidence of the validity of the patent, Judge Hough of the United States Circuit Court for the Southern District of New York, denying an application to punish for contempt of court the violation of one of the injunctions obtained by default, stating emphatically that the patent could not be established by injunction. As a whole, the result of these actions was not any great gain or loss to either side.

About six months after the actions against the first infringers to be proceeded against had been ended by their capitulation, the Ford Motor Company was organized in Detroit. One of the most important clauses in the articles of agreement of the Association of Licensed Automobile Manufacturers is to the effect that only firms which were actually engaged in the manufacture of automobiles on or before the date of its organization (it is not an incorporated body) were eligible to membership, and as the industry was hardly in its first swaddling clothes in the early part of 1903, it will be apparent that many important companies entering the field later were barred, willy-nilly. A notable instance of this was found in the organization of the Selden Motor Car Company in 1907, the inventor being com-

pelled to acquire an outstanding license under his own patent before he would be permitted to manufacture automobiles. This was accomplished by the acquirement of the license of the Buffalo Gasoline Motor Company, which relinquished its membership and gave up the manufacture of automobile motors, devoting its efforts entirely to the building of marine motors. As the number of licenses in the market was governed entirely by the failure or retirement of existing concerns, it will be evident that there was no alternative to companies starting at a later date, than to cast their lot with the Independents, whether they actually joined that organization or not. The American Motor Car Manufacturers' Association did not come into existence for some time afterward (February, 1905), and, due to poor management, did not make its influence felt at first.

Whether it had been possible to obtain a license or not would not have influenced Henry Ford, as he was determined to fight the Selden claims and has done so steadily for the past six years. From the very first, the action of the Electric Vehicle Company *vs.* the Ford Motor Company developed into a test case. During that period no stone has been left unturned to procure evidence of inventions antedating Selden. It is said that the claim of the combination of a hydrocarbon motor with a running gear and a device for disconnecting the engine from the running wheels is not tenable as such, whether as a basic claim or otherwise, and the upholders of the patent have accordingly founded their appeals to validity upon limitations concerning the type of engine to be employed. To prove these contentions, expert witnesses have been brought from abroad, a notable instance being that of Dugald Clerk, the well-known English authority on the internal-combustion motor, who spent several months here giving testimony for the owners of the patent. Every possible record having the slightest bearing upon the matter during the past century has been investigated, and in this way a mass of testimony, the taking of which was only concluded a month or so ago, has been accumulated.

Considerable misconception exists as to the vehicles which have been built under the Selden patent, one of the chief contentions of the defendants in the test case being that a vehicle built to conform to the patent specifications would be utterly impracticable. The car shown in the accompanying photograph and bearing the date 1877 will be seen to resemble the vehicle of the patent drawings, though, as a matter of fact, it did not come into existence until the latter part of 1905, or the early part of 1906, and it is claimed to differ materially from the original specifications in that electric ignition has been substituted for the original device described. What is known as the "Hartford" car, which was built a little earlier than the "1877" model by the Electric Vehicle Company at Hartford, is also shown by the photographs. In this engine the nature of the cycle differs materially from that of the patent, the motor being of the constant-pressure type, and also having electric ignition. It was tried out at the old Guttenberg track a few years ago, but it did not make as good a showing as the other car has in its various trials upon the New York streets, some of these events being illustrated by the accompanying photographs.

"Hartford" Selden car built in 1905.

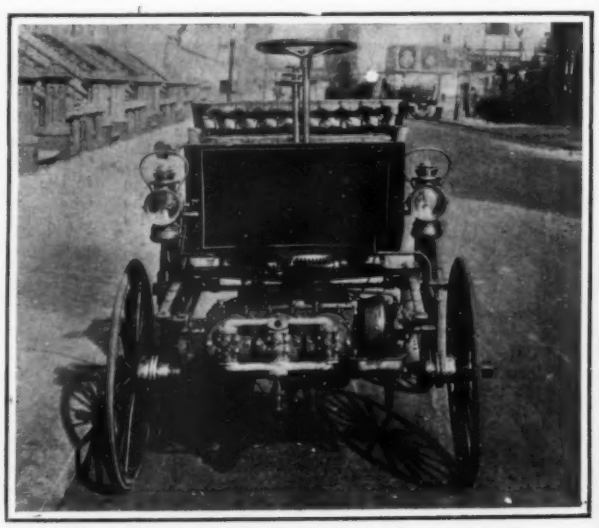
Note the control wheel. The exhaust is ahead of the car.

In the course of hunting up old records, an unusual number of instances that the respondents in the test case claim to antedate Selden have been found. Some of these go back as far as 1828, and it would require a volume of no mean dimensions simply to attempt to catalogue them all. The actual application of the automobile has really come about within a very few years, but it will be apparent from this that it is the development of a great many years of experimenting. Some of those cited as having antedated Selden in more ways than one, are Becquar, 1828; Lenoir, 1861; Carré, 1865; Menn, 1877, and a great number of others on the Continent. In this country, Brayton actually applied one of his constant-pressure type of gas engines to a street car in 1873, and to an omnibus five years later, though in neither case did these applications come into commercial use.

All this testimony is naturally merely supplementary to the contentions of the respondents that the machines built a few years ago by the upholders of the patent, in order to show that the latter was workable, are in reality not in conformity with the specifications of the patent, and that a machine built strictly in accordance with what it sets forth would be utterly impracticable. Both of the motors built to serve as exhibits in the case work on what is technically known as the two-part cycle, or more generally as the two-cycle, in that the cylinder fires a charge once in every revolution. The patent drawings show a type of engine having a differential piston, the small end acting as an air pump and maintaining pressure in a special air tank, while the liquid fuel is sprayed into the air rushing into the cylinder through the inlet valve, a small oil pump being employed for this purpose. One of the

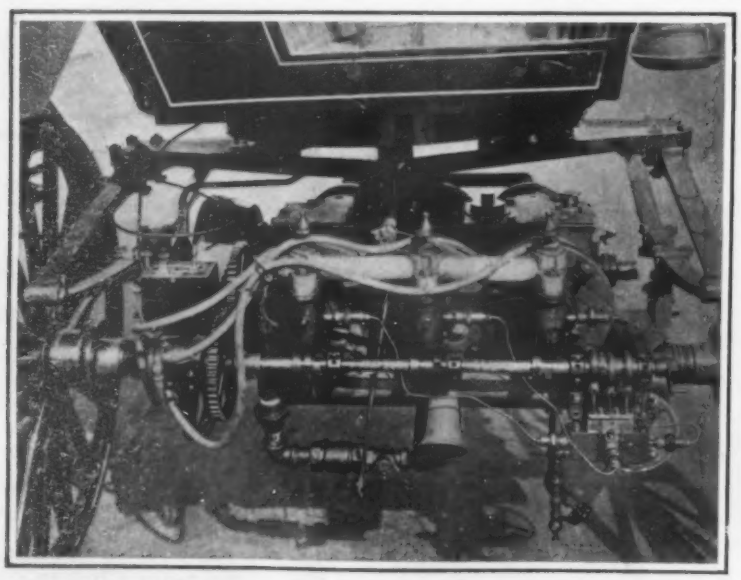
The "1877" Selden car built about 1905.

Standing at the curb is the car built by Henry Ford as an exhibit in the suit. It is equipped with a constant pressure engine and carbureter which was invented about 1865 and which is the large copper tank shown at the side.

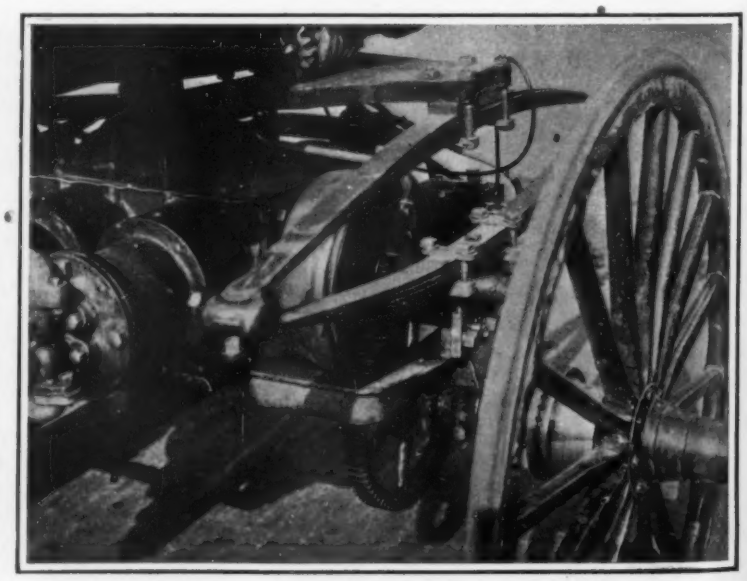


Front view of the "1877" Selden automobile.

The car has been built as nearly as possible to conform with the specifications of the Selden patent. The patent will expire in 1912.



Oil pump for fuel feed at right. The bell mouth extending downward is the exhaust.



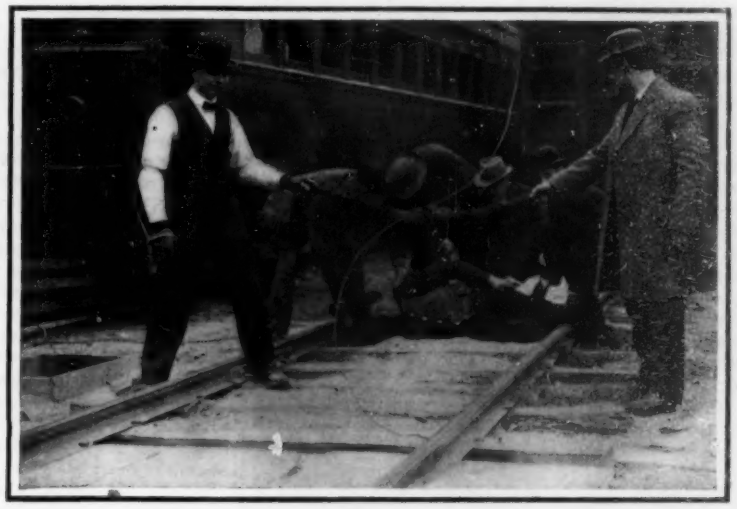
Friction clutch, reducing gears, and hub clutch.

AUTOMOBILES CONSTRUCTED ACCORDING TO THE SELDEN PATENT.

contentions of those who are trying to have the patent declared invalid is that such an arrangement of feeding air and fuel could never be practical on a vehicle, regardless of the smoothness of the roads.

To sum up, the situation with regard to the Selden patent at the present moment is about as follows: All the testimony to be presented by both of the litigants has been heard, the last having been taken early in January of the present year. This huge mass of matter, comprising many thousand typewritten folio sheets, will be printed as the record of the case, and if the thirty-odd cases that are on the Circuit Court calendar in New York for its spring sessions can be disposed of in time, the Selden case will come up for trial in May next, this consisting principally of an oral argument of the merits, *pro* and *con*, by counsel for each side. Regardless of which party the court's decision favors, it is a foregone conclusion that there will be an appeal. That will mean the lapse of about another year, before the matter again comes before the court, this time the Circuit Court of Appeals. Then some time will elapse before a decision is rendered, so that it will probably be 1911 before there is anything definite to record. A few of the customary delays will easily bring this up to the date of expiration in 1912.

The safest way of dragging a man off a live rail.



Using a coat as a rope to lift a live wire.

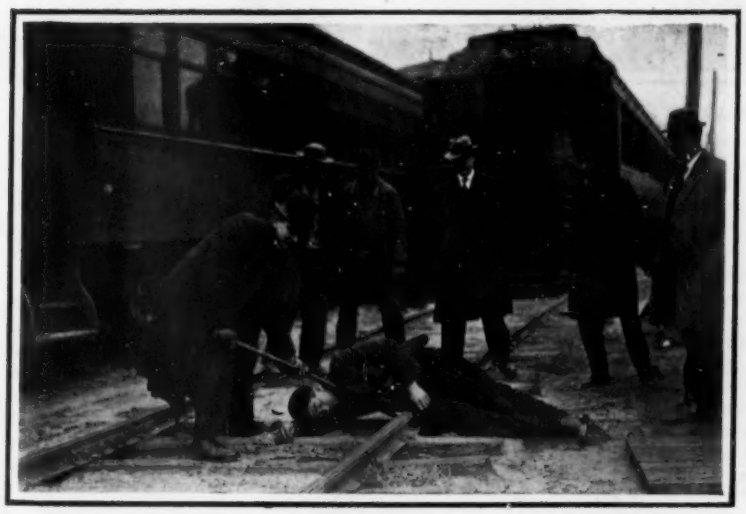
FIRST AID TO THOSE INJURED BY ELECTRICITY.

The increasing use of electricity on our large railroad systems, and the danger it offers to employees, have aroused officials to the importance of instructing their men how to act in case of accident. It frequently happens that a man who receives a shock is allowed to suffer from lack of proper immediate treatment, owing to the inherent dread of electricity among all those who are not familiar with the handling of electric circuits. Again, the victim may receive a severe shock and may appear to be dead when he is only stunned, and if properly worked over he may be resuscitated.

Not long ago the Pennsylvania Railroad assembled at Altoona, Pa., two hundred officials and employees from the various sections of its system, and gave them practical instructions in the various first-aid treatments which would be applicable to those injured by electricity. When a man is injured by coming in contact with a fallen live wire, it is a dangerous matter to attempt to move the wire away, or drag the victim out of contact with it, but by taking a coat by the sleeves and twisting it into a rope, as shown in one of the illustrations, two men on either side of the wire may lift it safely with the improvised rope. This experiment was tried even with a damp coat, and high-tension conductors were lifted without the operators' feeling the slightest shock. In case of a victim falling across a live rail, he may be removed either by seizing the twisted end of his coat and dragging him off, or by using a wooden pole; as dry wood is a very good non-conductor.

At the meeting in Altoona, a new type of pliers was tried out, and found to be just the thing for cutting live wires. The pliers were provided with wooden handles, so that the hand did not come in contact with any of the metal parts. The handles were boiled in paraffine, rendering them such good insulators that they withstood a pressure of 8,000 volts. With these pliers a line carrying 2,300 volts was repeatedly cut by a man standing on the ground, without his experiencing any unpleasant shock.

A very interesting series of experiments was undertaken, to determine what measure of danger there would be to a fireman who was obliged to direct a stream of water against a live wire. For this purpose several circuits were provided, one a 525-volt direct-current circuit. One side of this circuit was grounded, and a ⅝-inch stream of water was played against the other side. A voltmeter placed between the hose nozzle and the ground showed a potential of 20 volts when the nozzle was held at a distance of 7 feet 5 inches from the wire. At 3 feet 7½ inches the potential was 60 volts, and at 2 feet 2 inches 70 volts, while at 7½ inches it amounted to 210 volts. This showed that the firemen need not fear to operate the hose at a distance of 3 or 4 feet from the wire, and if standing on a ladder, they may hold the nozzle within a few inches of the wire. The same experiment tried with an alternating-current line of 2,050 volts produced no reading at all in the voltmeter when the nozzle was held within 3½ and 6½ feet of the line, and the only effect noticeable was a slight static discharge when the nozzle was touched with the hand. A similar result was observed when playing the hose at the same distances on a 4,100-volt alternating-current line. These experiments then show that a fireman need have little fear of injury to himself when operating in the vicinity of high-tension circuits. The experiment of using salt water in the hose line was not tried. No doubt, as salt water is a far better conductor than fresh water, the firemen might have found it quite hazardous to use the hose so close to the high-tension wires. Chemical extinguishers were found to be very dangerous. A voltmeter was connected between the ground and an extinguisher, and a stream from the latter played on a line carrying 2,500 volts. At a distance of 9 inches from the line, the voltmeter showed a reading of 1,500 volts. This is a very important matter to bring to the attention of the public, for the reason that passenger trains are usually equipped with chemical extinguishers, and in case of a wreck on an electrified line, serious consequences might result from the promiscuous use of these extinguishers.



Prying a victim off a live rail with a wooden pole.

Playing the hose on a high-tension conductor.

FIRST AID TO THOSE INJURED BY ELECTRICITY.

Official Meteorological Summary, New York, N. Y., February, 1909.

Atmospheric pressure: Highest, 30.41; lowest, 29.24; mean, 29.95. Temperature: Highest, 58; date, 10th; lowest, 5; date, 1st; mean of warmest day, 47; date, 24th; coolest day, 12; date, 1st; mean of maximum for the month, 43.7; mean of minimum, 30.9; absolute mean, 37.3; normal, 30.7; excess compared with mean of 39 years, 6.6. Warmest mean temperature of February, 40, in 1890. Coldest mean, 23, in 1875 and 1885. Absolute maximum and minimum for this month for 39 years, 69 and —6. Average daily excess since January 1, 4.5. Precipitation: 4.31; greatest in 24 hours, 1.56; date, 23rd and 24th; average of this month for 39 years, 3.80. Excess, 0.51. Accumulated excess since January 1st, 0.08. Greatest February precipitation, 7.81, in 1893; least, 0.82, in 1895. Snowfall, 1.4. Wind: Prevailing direction, west; total movement, 11,012 miles; average hourly velocity, 16.4 miles; maximum velocity, 73 miles per hour. Weather: Clear days, 3; partly cloudy, 11; cloudy, 14; on which 0.01 inch or more of precipitation occurred, 12. Sleet, 9th, 23rd. Fogs (dense), 15th, 16th, 24th. Mean temperature of the past winter, 35.23; normal, 31.80. Precipitation of the past winter, 10.85; normal, 10.94. Deficiency, 0.9. Snowfall of the past winter, 16.

PROGRESS OF THE 20,000-TON "NORTH DAKOTA."

The accompanying photograph, taken at the yards of the Fore River Shipbuilding Company, shows the advanced stage to which the construction of our first battleship of the "Dreadnought" type, the "North Dakota," has been carried. The point of view from off the starboard quarter has been well chosen, for it gives a striking impression of the unusual gun-power of this great battleship. The total armament of ten 12-inch guns is mounted in five 2-gun turrets; two forward on the forecastle deck, the guns of the after turret firing above the roof of the forward turret, and three on the main deck abaft of the after mast. In our photograph the pair of 12-inch guns in the foremost turret are to be seen swung over to starboard. The other turret is to be seen in course of assembling upon the dock in the middle foreground. This view is instructive as showing the plate framing of the turret before the roof and the side and front armor have been put in place. In the immediate foreground is one of this turret's 45-caliber, 12-inch guns. To the left of the breech of the gun lies one of the port shields, which are mounted upon the guns, within and close up to the port opening of the turret, for the purpose of preventing the entrance of shells. This shield moves with the gun as it is elevated or depressed, and serves to close the opening in whatever position the gun may happen to be.

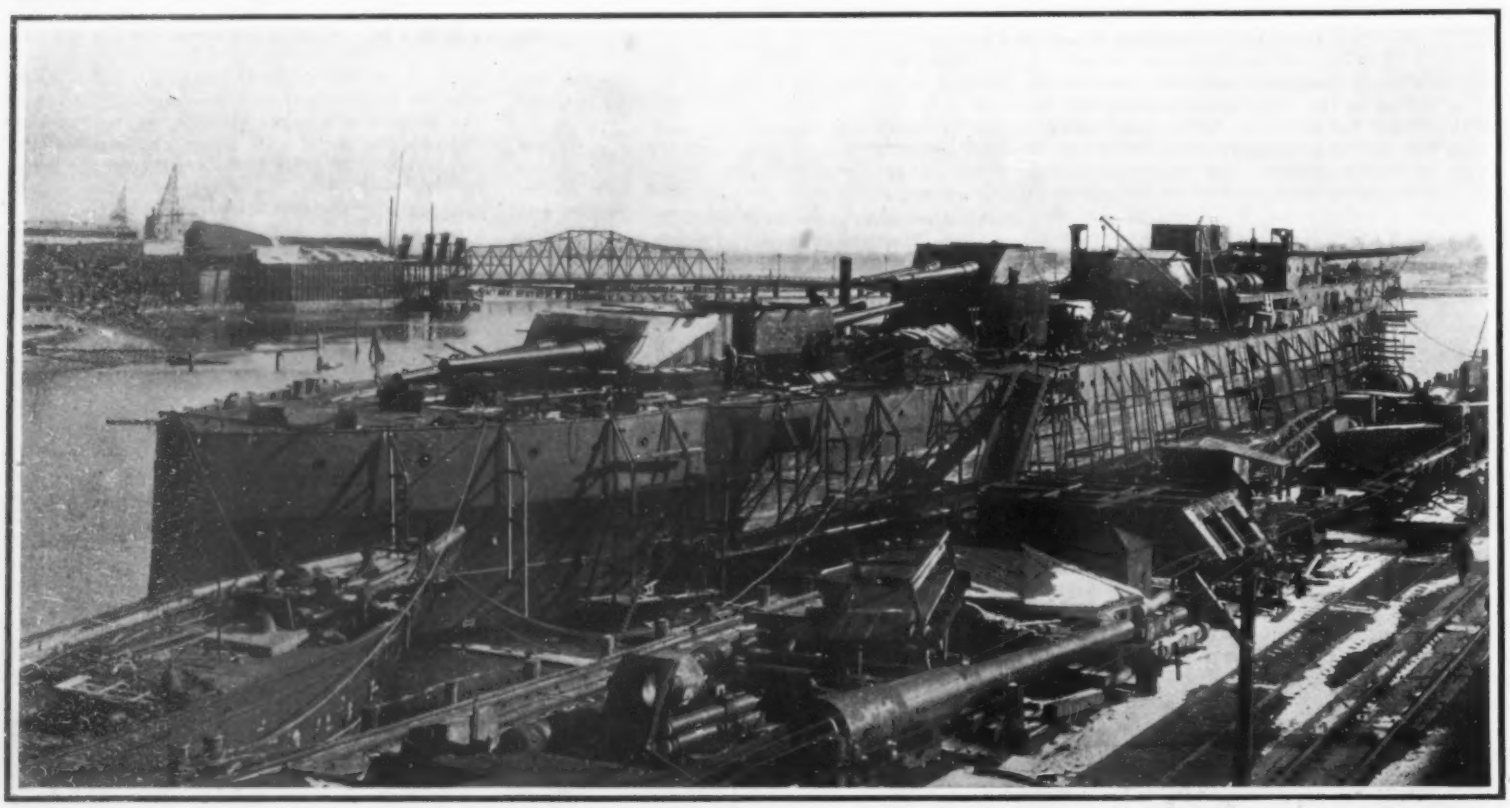
Of the three turrets which show up so conspicuously on the after deck of the "North Dakota," the first is elevated sufficiently to enable it to fire dead astern over the roofs of the two after turrets, so that if the "North Dakota" should be engaged in action with a ship or ships astern of her, she could concentrate the two guns in this turret and the two in the aftermost turret upon the enemy.

All five turrets are located on the longitudinal center line of the ship, and all ten guns can be fired on either broadside. This is one of the excellences of the "Dreadnought" design, and indeed the credit for introducing the center line arrangement is due to our own naval constructors, with whom it originated. The arrangement affords a distinct advantage over the English system as used on the original "Dreadnought" and all subsequent ships of her type; for, although they also carry ten 12-inch guns, it is possible to concentrate on each broadside only eight of these guns. This limitation is due to the fact that two of the turrets are placed, one on each beam, with the superstructure of the ship intervening between them; and, consequently, on whichever side the ship is engaged, it necessarily follows that the broadside or "wing" turret of the opposite side is masked by the superstructure and cannot for the time being be brought into action. The English arrangement has the advantage that both of the wing turrets can be fired directly ahead or astern, which gives the ship a heavy end-on fire of six 12-inch guns, as against an end-fire of four 12-inch for the "North Dakota." It is unlikely, however, that much fighting will be done from the end-on position. Future engagements will be broadside to broadside; and hence, the American system assures a greater all-round efficiency for a given number of guns.

The series of triangular-headed vertical frames, which are seen hanging along the side of the "North Dakota," are the supports for the platforms from which the carpenters are engaged in bolting on the wooden backing for the side armor, a considerable portion of which, traceable on the photograph by its lighter shade, is already in place.

The "North Dakota" is a huge ship in every respect. Her length over all, 518 feet 9 inches, is equal to that of many ocean liners. Her beam of 85 feet 2½ inches is exceeded only by that of the "Lusitania" and "Mauretania." Her normal displacement is 20,000 tons and her full load displacement over 22,000 tons. She will stow 2,500 tons of coal in her bunkers, and her Curtis turbines of 25,000 horse-power are designed to drive her at a contract speed of 21 knots, although on trial she will probably make over 22 knots. In addition to her main battery of ten 12-inch guns, she will carry fourteen 50-caliber 5-inch guns on the gun deck below. The protection will consist of a wide belt of armor, varying in thickness from 10 to 12 inches in the lower half of it, and from 10 to 8 inches in the upper half. As a protection against torpedo attack, her hull is being built with an unusually complete system of underwater subdivision, which is so elaborate that no single blow from the torpedo could sink her.

In respect to the speed with which she has been built, the "North Dakota" will mark an era in the progress of our navy. Although her keel was laid as late as December 16th, 1907, she was launched November 10th, 1908, and at the present time is nearly 80 per cent completed. She will probably have her trials during the late summer or early autumn and, unless something unforeseen occurs, she will be completed several months before the contract date of June 21st, 1910.



THE "NORTH DAKOTA," OUR FIRST "DREADNOUGHT," 80 PER CENT COMPLETED.

A $500 Prize for a Simple Explanation of the Fourth Dimension.

A friend of the Scientific American, who desires to remain unknown, has paid into the hands of the publishers the sum of $500, which is to be awarded as a prize for the best popular explanation of the Fourth Dimension, the object being to set forth in an essay the meaning of the term so that the ordinary lay reader can understand it.

Competitors for the prize must comply with the following conditions:

1. No essay must be longer than 2,500 words.
2. The essays must be written as simply, lucidly, and non-technically as possible.
3. Each essay must be typewritten and identified with a pseudonym. The essay must be inclosed in a plain sealed envelope, bearing only the pseudonym. With the essay should be sent a second plain sealed envelope, also labeled with the pseudonym, and containing the name and address of the competitor. Both these envelopes should be sent to "Fourth Dimension Editor, Scientific American, 361 Broadway, New York, N. Y."
4. All essays must be in the office of the Scientific American by April 1, 1909.
5. The Editor of the Scientific American will retain the small sealed envelope containing the address of the competitor and forward the essays to the Judges, who will select the prize-winning essay.
6. As soon as the Judges have agreed upon the winning essay, they will notify the Editor, who will open the envelope bearing the proper pseudonym and containing the competitor's true name. The competitor will be notified by the Editor that he has won the prize, and his essay will be published in the Scientific American.
7. The Editor reserves the right to publish in the columns of the Scientific American or the Scientific American Supplement three or four of the more meritorious essays, which in the opinion of the judges are worthy of honorable mention.

Prof. Henry B. Manning, of Brown University, and Prof. S. A. Mitchell, of Columbia University, will be the judges.

Death of William A. Austin.

William A. Austin, who constructed one of the first steam carriages and steam bicycles, died on March 8th at Winthrop, Mass., at the age of 85. Despite his advanced age, Mr. Austin kept up his interest in inventions to the last. At the time of his death he was improving a gasoline lamp which was shortly to have been placed upon the market. Mr. Austin built a steam carriage at about the beginning of the civil war, and exhibited it throughout the country, with considerable profit to himself. Later he built a steam bicycle of phenomenal speed.

Collier "Prometheus" Launched.

On December 5th the collier "Prometheus," the first great steel vessel of the United States navy built at a navy yard on the Pacific coast, was launched at the Mare Island navy yard, Cal. The structural material for the "Prometheus" was received about the middle of September, 1907, and work began on October 1st, the keel being laid on October 18th. The construction thus occupied less than fourteen months and the "Prometheus" is further advanced at the launching than has been the case with any large vessel built previously at a United States navy yard. Notwithstanding the higher cost of material and labor on the Pacific coast, she will be completed at a smaller cost than the sister vessel that is being built at the New York navy yard.

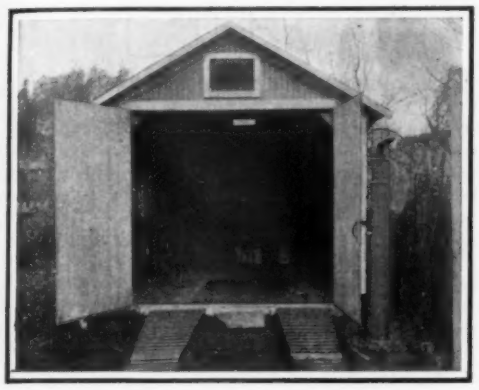
An interesting series of experiments in wireless telegraphy were made not long since between portable stations which were installed one in the suburbs of Paris and the second at Melun. The messages were transmitted and also received with an antenna which has a very moderate height, this being not more than 60 or 70 feet. The antenna is designed so that it can be mounted within fifteen minutes by one or two men.

Handy Man's Workshop

A PORTABLE AUTOMOBILE HOUSE.

BY W. M. BENNETT.

It is the purpose of this article to show how to build an automobile house which has the following advantages: It is portable, as all sections and other parts are held together with a minimum number of bolts and screws. It requires no special skill with



FRONT VIEW OF THE AUTOMOBILE HOUSE.

tools. It is easily set up and taken apart. It is light and sufficiently strong, and presents a neat and finished appearance.

The complete bill of materials for the house as shown herewith costs $70. To this may be added about $10 for paint. Because of its ready portability, it may be set up by the lake shore or in the woods and used as a summer cottage. It makes but one easy wagon load for two horses. It has no masonry supports, and therefore does not revert to the owner of the land on which it is placed, but it can be moved whenever moving day comes. The open doorway gives almost seven feet clearance, which is sufficient to admit an auto with top up. It is large enough for a small touring car with room to work all around it, as well as for the storage of supplies. With a runabout it gives room for shelves and a bench for a convenient workroom at the end.

The frame is of hemlock, Fig. 1, and measures 15 feet 4 inches by 9 feet 6 inches by 7 feet 8 inches high. Above the floors the frame consists of only four corner posts, the plate frame, two pairs of rafters, two tie-pieces—not shown—across from plate to plate at the foot of the rafters, all of 2-inch by 3-inch hemlock dressed, and four roof boards, ⅞ inch by 4 inches. The gable sections serve also as rafters. The sills are held together at the corners by angle irons 6 inches by 6 inches, 3/16 inch thick and 1 inch wide, fastened with carriage bolts ⅜ inch by 2½ inches, Fig. 3. These should fit snugly in the sills, so that the square shoulders will prevent turning, and the heads are countersunk flush.

The floor joists rest on straps nailed to the side sills, Fig. 4. Two of the joists, Fig. 2, are fastened with lighter angle irons to prevent the sills springing outward. The rest are held in place by small cleats. Two mudsills, 2 inches by 3 inches, are laid under the joists to stiffen them for the load of the machine. These, as well as the whole frame, are blocked up and rest upon boards or plank pieces about 8 inches by 12 inches crossed and laid up under the sills at distances of four or five feet. If these supports settle by the action of frost, it is a simple matter to level up by adding more.

The corner posts stand on the sills, to be fastened later by corner boards, Figs. 3 and 5. The plate sticks are halved together at the corners, a hole is bored down through their ends into the top of the post, and a 24-penny wire spike is pushed into it. The plates are also held together by small angle irons at the corners. At this point the frame must be stayed up while the side and roof sections are put in place.

The side panels, Fig. 6, are of matched Georgia pine ceiling material, 7/16 inch thick, dressed and beaded one side, cleated with ⅞-inch dressed pine on the outside as shown, and cleated with a strip of the 7/16-inch material on the inside. They cover each 3 feet by 7 feet and are all interchangeable except that the corner sections are slightly modified to slip under the corner boards.

The window sections are made interchangeable with the rest, and the position of the windows may be varied to suit circumstances. The bevel on the cleats and on base and eaves boards, Figs. 7 and 8, aids in excluding the weather. The way in which the battens and cleats of the panels interlock to give tightness and strength is apparent from details of Fig. 6. Cleats, 2 inches by ⅞ inch, are fastened with 1⅝-inch package wire nails, clinched on the outside. The inside cleat is fastened with ¾-inch nails clinched inside. In general, the nailing is done with nails just long enough, so that the sharp points prick through slightly. The nail is driven against an iron block, and is really bent within the wood instead of forming a clinch visible outside.

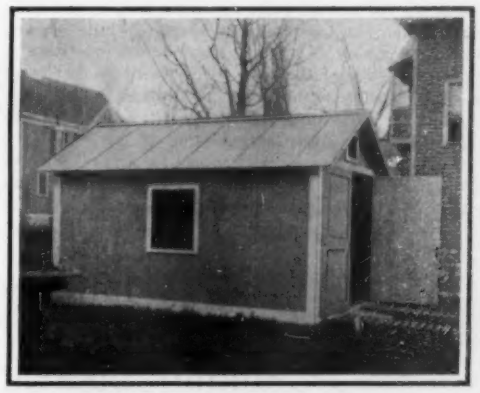
In the window panel the frame is slotted on the sides to admit the battens. This panel is further stiffened inside by a frame of ⅞-inch stuff around the window opening. The double casement windows are factory made, sash 1⅜-inch thick, and cost $1.50 per pair or window. They are hung with parliament butts—separable—swing inside, and shut against the outside frame about ⅜ inch. The sill is beveled outside of foot of window sash, and a small square bead is run on the sill for them to shut against. The windows are rabbeted together with a simple L rabbet, and are then fastened inside with small bar bolts top and bottom.

The front gable section is framed of ⅞-inch pine, with the 7/16-inch siding nailed to it. The bottom board of this frame overhangs the front plate 1½ inches, and the matched stuff rests on top of the plate. This leaves the lower ½ inch of the plate for the doors to shut against. The gable window opening is framed around with ⅞-inch stuff outside, and with 7/16-inch stuff inside. The gable window sash are home-made of ⅞-inch pine, and are hinged with separable butts to swing up for ventilation. The rear gable is slightly modified by narrowing up the bottom board and beveling it to overhang the plate ¾ inch, and by fastening a beveled trim board to the plate to retain the panels below the plate in the same way, the side panels are held by eaves boards.

The floor is made in three sections strongly cleated underneath with cleats passing two inches beyond the section edges to stiffen the joints between sections. The floor serves to retain the rear panels on the sill, but stops flush with the front face of front sill.

The front door is constructed of ⅞-inch pine. The top boards shut against the plate ½ inch, while the bottom boards shut against the ends of the floor. The matched stuff stands between the plate and the floor.

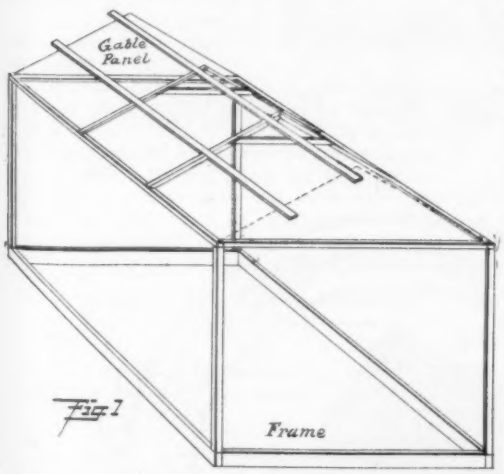
The roof sections have an overhang at the eaves of about 9½ inches, and the same overhang at the gable ends. Ten sections cover 3 feet by 6 feet 4 inches each, and two sections cover 2 feet by 6 feet 4 inches. They have each three cleats of the same 7/16-inch material, the bottom cleat being only one inch wide. They are first cleated together (Fig. 9) with the end of a strip of unbleached factory cloth under the bottom cleat, which is nailed from the outside with all nails well clinched. The cloth is smoothed loosely over the section and cut off, and then the face of the section is given one or two coats of white lead mixed thin with

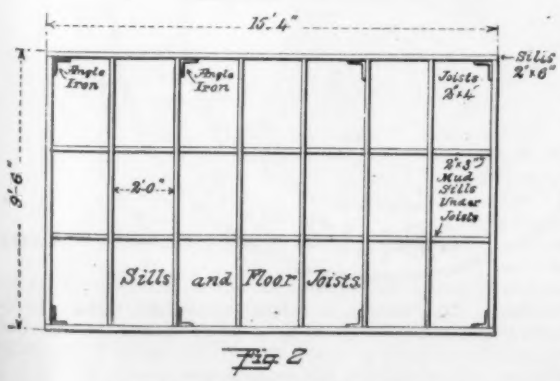


A SIDE VIEW OF THE PORTABLE AUTOMOBILE HOUSE.

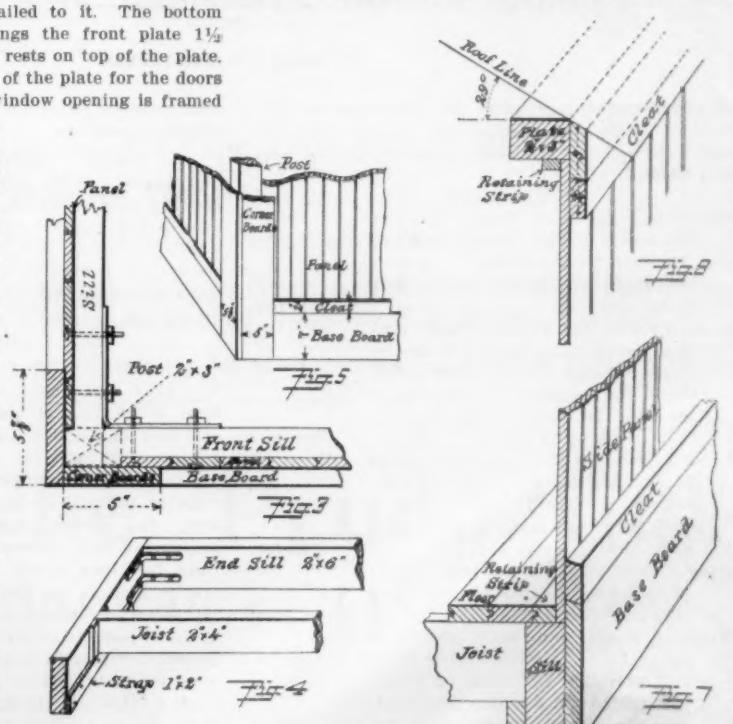
raw oil and turpentine. After this dries the cloth is brought over, laid smooth without stretching, and tacked thoroughly at top and sides. Then a batten strip is nailed on at the left edge to cover the joint, as in the side panels. Care must be taken not to stretch the cloth, but to leave it as loose as possible without actual wrinkles, as it will shrink in the subsequent painting. The finished panel must now be given repeated coats of good paint until the cloth is filled and a glossy, weatherproof deck surface is formed. On each slope of the roof two roof boards of hard pine, 4 inches by ⅞ inch by 17 feet, are let into and flush with the rafters and gable sections and fastened with long screws.

After the frame is up, the base boards and eaves boards are temporarily tacked in place; then the panels are put in place from the inside, bottom end first; then the base and eaves boards are permanently adjusted and fastened to sill and plate with long screws. The corner boards are set together with screws, and then fastened in place with long screws into sill and post and plate. The panels next the corner boards are bolted to the corner boards at the middle cleat with roundhead stove bolts, using washers. The roof sections are held in place by stove bolts through the loose edge of the battens and the roof boards, and by screws into the plate. The ridge boards, one 4 inches,





THE FLOOR PLAN AND FRAME.



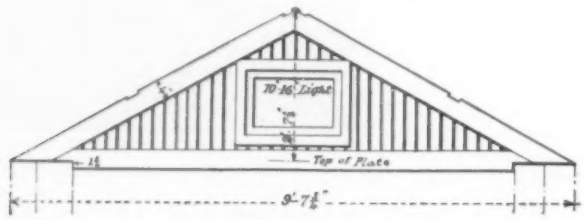
VARIOUS DETAILS OF CONSTRUCTION.

the other 5 inches wide, are beveled and put together with long wire nails. They are then put in place, and pieces of the 7/16-inch siding, 2 feet 9½ inches long, are slipped under the ridge boards to level up between the battens, and stove bolts are put through the ridge board, understrip, and roof section. This fastening adds much to the strength of the roof. Finish boards of the 7/16-inch material should be cut and fitted at the gable edge of the roof to give a neat appearance. To stiffen the door opening, brace boards should be put across inside from plate to post at the upper corners of the opening.

In the work of erecting the building no fastenings are to be used but bolts and screws, and to facilitate the work, provide two bitstocks, one for a screwdrive bit, the other for a proper size gimlet. After the house is finished, it should have three coats of paint well brushed into the grooves in the beading, etc. The inside of the doors should also be painted, since they are frequently exposed to the weather.

The panels, and all parts requiring time in the making, can be put together in a shop of limited space, and given a coat of priming paint before erecting the building. This coat should be of white lead and oil, possibly shaded with lampblack ground in oil, and thinned well with turpentine, so that it will strike into the pitchy surface of Georgia pine.

The house shown has been in use for a year, and has proved both tight and strong, in contradiction to the critics of the plan, who thought it would do all sorts



THE GABLE AND SIDE PANELS.

of undesirable things under the heat and rains of summer. It is most essential that it be well painted before the weather acts upon it, and that it be kept well painted.

LUMBER BILL.

Side Panels and Roof Panels.—Matched and beaded Georgia pine ceiling stuff, 7/16 inch by 2½ inches by 14 feet. Lengths to cover 700 square feet; add ¼ for matching.....875 square feet

Sills, Mudsills, and Joists.—Rough hemlock, 2 sticks 2 inches by 6 inches by 16 feet; 1 stick 2 inches by 6 inches by 20 feet; 4 sticks 2 inches by 4 inches by 19 feet; 2 sticks 2 inches by 3 inches by 16 feet..... 119 feet

Upper Frame.—2 inches by 3 inches dressed hemlock, posts, 2 sticks 14 feet; rafters, 2 sticks 12 feet; plates, 2 sticks 16 feet; 2 sticks 20 feet (1 for plate ties)..... 62 feet

Floor.—Third quality pine flooring, matched and dressed, 16 feet long, cover 180 square feet, add ¼..... 225 feet

Framing Boards.—Of same stuff, 8 4 inches by 14 feet, 2 8 inches by 16 feet; cleats, 26 2¼ inches by 3 feet; next to doors, 1 8 inches by 16 feet; joist supports, 2 2 inches by 14 feet, approximate ..... 150 feet

Finish Boards.—Second quality pine, ⅞ inch dressed and ripped, corner boards, 2 5 inches by 14 feet, 2 6 inches by 14 feet; base and eaves, 2 7 inches by 16 feet, 2 3½ inches by 16 feet; base and rear plate, 2 7 inches by 16 feet, 1 2½ inches by 12 feet..... 76 feet

Roof and Ridge Boards.—Georgia pine, ⅞ inch dressed, 5 4 inches by 18 feet, 1 5 inches by 18 feet; window sills, white pine dressed, 1 2 inches by 3½ inches by 7 feet..... 44 feet

AN INTERESTING EXPERIMENT AND ITS EXPLANATION

BY ALFRED P. MORGAN.

Ordinarily, the precipitate produced by mixing two chemicals in solution is formed more or less slowly. But in the following experiment we have a case where two different speeds of reaction are shown. The first takes several seconds before it is complete, while the second is quicker than a flash. The experiment also shows just when that action takes place.

When iodine is added to a starch solution, or *vice versa*, the solution is colored blue. This is a well-known test for either free iodine or starch.

Prepare a solution, A, of starch in water, and add to it some sulphurous acid. Prepare a separate solution, B, of potassium iodate, and add to it a little sulphuric acid. These last two substances form potassium sulphate and iodic acid, in accordance with the following reaction:

$$2KIO_3 + H_2SO_4 = K_2SO_4 + 2HIO_3.$$

The iodic acid is the only constituent which plays any part and need be considered in the experiment proper. Pour A + B together quickly into a glass vessel and watch it closely. In a few seconds the solution will change like a flash to a deep blue. The explanation and reactions are as follows:

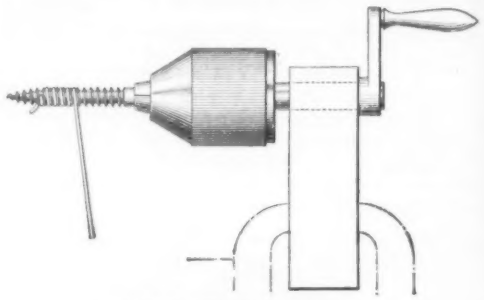
$$HIO_3 + 3SO_2 + 3H_2O = HI + 3H_2SO_4$$
$$5HI + HIO_3 = 5I + 3H_2O$$
$$SO_2 + 2H_2O + I = H_2SO_4 + 2HI.$$

The iodic acid unites with the sulphurous acid to form hydriodic acid and sulphuric acid. The iodic acid then unites with some of the hydriodic acid and forms iodine. But the iodine does not get a chance for existence, because it is immediately taken up by some of the sulphurous acid and formed into iodic acid. This process keeps on as long as there is any sulphurous acid present, and the solution remains clear, for there is also no free iodine present. But just as soon as the last molecule of sulphurous acid disappears, the whole solution turns blue so quickly that one looks twice before believing. The blue color generally flashes in from 20 to 40 seconds, depending upon the concentration and strength of the solutions. With a little experimenting the solution may be made to change in a predetermined time. It is a good idea to use a small part of the solution, and time it before mixing the remainder. Care should be taken not to use too much sulphurous acid.

HOME-MADE SPRING WINDER.

BY J. O. BROUILLET.

Not long ago the writer was called upon to replace a broken spring in a machine. It had to be done at a moment's notice, as the work could not be held up.



HOME-MADE SPRING WINDER.

The supply of springs was exhausted. The writer was given a piece of No. 60 wire, but no one had such a thing as a winder, so he was obliged to make one, and had a spring within a half hour.

In a junk pile was found a piece of soft steel, 4 x 1½ x ½ inch wide, with a ½-inch hole in one end. A ½-inch lag screw was placed in a brace, a pinhole was drilled in the gimlet end of the screw, then putting the screw through the hole in the steel, which was held in a vise, the spring was easily wound.

This suggested the construction of the spring winder illustrated herewith. A piece of soft steel, 4 x 1¼ x 1¼ inch, forms the body. A ½-inch shank, fitted with a chuck taking from 0 to ½ inch, was run through the hole at the top and provided with a crank handle.

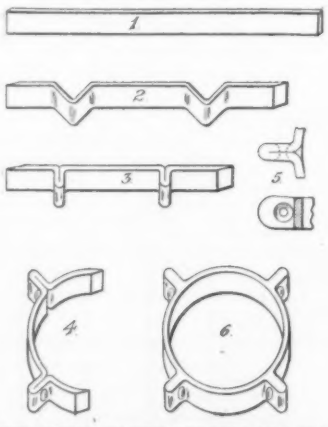
An assorted lot of lag screws serves for the open springs, and rods are used for the close springs and springs of oval or odd shapes.

FORGING A MASTHEAD OR BOOM RING.

BY I. G. BAYLEY.

On account of the severe strains to which the lugs on a masthead are subjected, they and the ring are usually made from one and the same piece of iron, instead of the former being welded on after the ring is made. The ring is made in two halves, the iron being cut sufficiently long to make two lugs, and go half way round the masthead or ends of main or jib boom. The comparative length of the iron is given in Fig. 1. The diameter of the bands, of course, varies, and the section of iron used is in proportion. The position of the lugs is marked out, and the bar heated and bent into shape (Fig. 2), the ends being shaped for welding, when the two halves are brought together, to form the circle. The lugs are closed and welded in the next heat (Fig. 3). Fig. 4 shows the half band, a similar one being made in the same manner. The holes for the wire ropes are countersunk on both sides, and are made at the roots of the lugs, close up to the bands. They are flattened out when being welded, their depth being a little more than the depth of the band, to give more metal in the direction of the pull.

To give a smooth surface on the inside of the band, a piece of metal called a "fish" is welded in the "gutters" formed at the roots of the lugs. These several details are shown in Fig. 5. The two halves are next welded, as shown in the completed band (Fig. 6). The outside edges of the band, top and bottom, are rounded off, and all sharp corners on the lugs removed, to prevent any accidental wear on the ropes. The top of the mast or ends of the booms are cut down to a shoulder, the thickness of the bands in width, and the bands driven on.



PROGRESSIVE STEPS IN THE FORGING OF A MASTHEAD.

RECENTLY PATENTED INVENTIONS.

Of Interest to Farmers.

HEATER FOR BROODERS.—J. C. Nicholls, Blue Mound, Ill. The invention refers to poultry culture, and its object is to provide a heater arranged to produce a proper heating of the air supplied to the young, to cause moistening of the heated air, and to allow convenient removal of the heater from the brooder, whenever it is desired, for cleaning, repairing or other purposes.

CULTIVATOR ATTACHMENT.—D. B. Browning, Morrison, Okla. In operation the fender is supported by the hanger arm, and the runner is adjusted below the edge of the blade to prevent earth thrown up from covering the plants, yet permitting some earth to be thrown toward the plants at the roots. The runners prevent the fender being removed by earth thrown up by the plow. A chain acts to take the weight of the blade from the runners, when turning or moving. The runner permits the fender to follow ground inequalities, so as to protect the plants, even when they occupy a lower plane than that traversed by the cultivator wheels.

Of General Interest.

NON-REFILLABLE BOTTLE.—M. Forst, New York, N. Y. The aim in this case is to provide a new and improved non-refillable bottle, which is simple in construction and arranged to effectively prevent refilling of the bottle with spurious liquids by unauthorized parties, especially when the bottle is held in a horizontal position.

HOSE CONNECTION FOR STEAM THAWPOINTS.—J. R. Mathews, Fairbanks, Alaska. The purpose in this invention is to provide details of construction for connections, which enables the attachment in a simple and secure manner, of one end of a steam conducting hose upon the body of a thaw-point into frozen ground, that is to be thawed by steam passing down through the thaw-point.

LENS-MOUNTING.—G. Lowenstein, New York, N. Y. The more particular purpose in this case is to produce a lens so readily detachable from the framework which normally supports it and so readily attachable to the same, that any person can instantly remove the lens from the frame or replace it, the construction, however, being such that when the lens is upon the frame it is perfectly rigid and free from lost motion.

FEED-DISTRIBUTER FOR VANNERS.—C. P. Whitmore, Salt Lake City, Utah. The distributer is adapted to be disposed transversely over the conveyer. Side rails are on the distributer and a rear central member with obliquely disposed members connects the rear member with the rails. Guide members are provided at right angles to the rails, and material is introduced behind the slot in the rear guide member. Buffers direct the material in front of the last named member, there being rows of guide members in front of the same, to distribute the material, which flows to and through the feeder openings in front.

MEANS FOR KEEPING ACCOUNTS.—A. L. Grayson, Rutherfordton, N. C. The object in this improvement is to provide means for keeping accounts in banks and other institutions and business houses, and arranged to reduce the liability of clerical errors and mistakes to a minimum by providing movable tapes, one for each customer's account, the tapes being adapted to receive thereon the daily transactions.

SEAM-RIPPER.—T. F. Freeman, Dover, Maine. The invention relates more particularly to rippers such as combine a lap-board and cutter, and are adapted to be used for opening of letters, wrappers, seams of garments, and the like. The object is to provide a device adapted to be adjusted across the lap of the user, so that the cutter will be in a convenient position for use, thus leaving both hands of the operator free.

CEILING CONSTRUCTION.—P. Allinio, San Pablo, Cal. The inventor's object is to eliminate the furring-strips and support the lath directly from the concrete constituting the floor and at a distance therefrom. The construction is thus rendered fire-proof, the total thickness is reduced and the plaster may be applied immediately after the wooden forms are removed.

Hardware.

RAZOR-STROP.—M. Krischer, New York, N. Y. This invention refers to improvements in the means for securing the yoke which holds the attaching ring to the end of the strop. The object is to provide means for use in securing the ringholder to the strop, in such a manner as to obviate the use of a bolt and nut, as in the constructions at present in the market.

JAR-OPENER.—M. C. Dearing, Haverhill, Mass. In this case the inventor provides a device which can be arranged about the top of a fruit jar or other receptacle, and which has means whereby the cover of the jar may be readily removed, without danger of injury to the same or to the rubber washer on which it rests.

Household Utilities.

KITCHEN-SINK COVER.—A. G. Demarest, New York, N. Y. The more particular object here is to produce a type of sink cover suitable for use in the kitchen and provided with openings of special form through which hot and cold water may pass from the spigots, and further provided with smaller openings for facilitating the drainage of such water as may be accidentally spilled upon the sink cover.

COT FOR CHILDREN.—Muriel M. S. Binney, St. Clair, Elizabeth Bay, Sydney, New South Wales, Australia. The purpose of the invention is to provide what is called a collapsible safety cot which shall be capable of being folded up into a small compass when not in use, and which when set up shall form a rigid structure wherein a child may be left without fear of his falling out or otherwise coming to any harm.

COFFEE-URN.—O. A. Nenninger, El Paso, Texas. The coffee may be extracted quickly by causing boiling water to percolate through the ground berries supported above an inner vessel for holding the extract. Means are provided for passing the liquid repeatedly through the mass, to increase the strength of the extract. The flow of the liquid in either case is produced by steam generated in the boiler or outer vessel, the pressure of which can be controlled by means of a stop cock.

Machines and Mechanical Devices.

WASHING-MACHINE.—J. W. Seifert, St. Louis, Mo. The invention comprises a combination with the body of the machine, and a kettle supported therein, of a reticulated closed drum, parallel levers in which the drum is journaled, a shaft the ends of which extend from the body, to serve as the pivots of the levers, a sprocket wheel fixed on one of the drum posts, another mounted loose on one of the lever pivots and furnished with a rigid handle socket, and a chain applied to and containing the two sprocket wheels.

CASH REGISTER, INDICATOR, AND RECORDER.—J. F. Parker, Kansas City, Mo. The invention is an improvement in registers in which are employed multiple receptacles or money tills and a series of vertical banks of keys bearing numbers and characters corresponding to others inscribed on registering and printing wheels also slidable indicating tablets that are all movable and adapted to register and display or indicate and also print the amount of a sale, the initial of the clerk, and the character of the transaction. Mr. Parker has made an improvement on the above machine and the patent is on that class having a series of movable keys which constitute the primary means for operating, through the medium of intermediate devices, the registering, indicating, and recording mechanism proper.

PEANUT-PICKING MACHINE.—F. F. Ferguson, Murfreesboro, N. C. In operation the vines are fed through a chute against a drum, and are engaged by pins, and carried rearwardly between vibrating frames, and against spring teeth. The passage of vines beneath the teeth, separates them from each other, and removes a greater part of the nuts therefrom, the nuts falling through the drum onto the carrier, which delivers them onto the stemming device at the rear, the fan acting to clean them from the leaves and broken stems.

MOLD FOR CONCRETE-WALL CONSTRUCTION.—G. Taubert, Pittsfield, Mass. More particularly this invention relates to means for holding the mold sections in engagement with the walls and for raising them step by step as the wall is built up. It also involves certain construction in collapsible cores to be used in connection with the molds and cooperating with the support of the mold sections to permit the removal of the latter.

WIRE-FENCE STRETCHER.—W. Hopper, Jefferson, Iowa. In this patent the invention pertains to improvements in devices for stretching wire fencing while the latter is being secured to the fence posts, and relates more particularly to the mechanism for engaging with one of the posts and with a clamp secured to the fence for stretching the latter.

CLAMP FOR WOVEN-WIRE-FENCE STRETCHERS.—W. Hopper, Jefferson, Iowa. The invention relates more particularly to stretchers of the type shown in Mr. Hopper's previous patent. The present invention relates solely to the clamp, and this clamp may be used in connection with any suitable tension mechanism.

AIR-SHIP.—F. L. Orr, Omaha, Neb. In its broad comprehension, the invention comprises an aeroplane, a basket, car, or other similar means affording carrying support; and means consisting of a combustion chamber into which gas, or other fluid may be charged and the fluid charge be ignited, and the ignited charge liberated through an exhaust opening into the air, directly under the aeroplane.

CLOCK AND COIN-FREED WINDING APPARATUS.—A. G. P. Wingaard, Römersgade 3, Copenhagen, Denmark. This invention is designed to provide mechanism in combination with a clock adapted to collect definite sums of money at certain times, for instance, the premiums on an insurance policy payable in daily or weekly rates, savings bank deposits, and the like, thus doing away with the cost of collecting these payments, which is often out of all proportion with the amount collected.

SAW LEVELING AND STRETCHING MACHINE.—N. L. Botten, Opelousas, La. The improvement is in machines for use in removing lumps, kinks, ridges, etc., in saws, commonly known as "leveling," preparatory to stretching the saw in adjusting its "tensions," which is secured in machines as now generally used by passing the saw longitudinally between rollers of equal width and thereby stretching the saw equally on both surfaces.

SAFETY ELEVATOR-CAGE.—C. H. Sturgis, Granville, Ill. The cage is provided with dogs at its bottom, adapted to be thrown into engagement with hooks hung in sets to swing in channel irons in the shaft, a stud actuating means to throw the dogs into engagement with the hooks, over which it is adapted to slide during upward movement of the cage, the dogs locking with one set of hooks should the cage start downward. At the upper part of the shaft a trip throws the dogs inwardly and free from the hooks, means holding the dogs away from the hooks swung in the shaft. Means permit the dogs to engage the hooks should the cable break.

CONCRETE-BLOCK MACHINE.—E. P. Auger, Corinth, Miss. This machine makes blocks of concrete for use in building of various kinds, employing concrete material. An object of the invention is to provide a device in which the block may be molded and then by the use of a cam lever, the sides of the mold can be loosened and let down vertically, leaving the molded block upon the base from which it can be readily removed.

BUNDLE-WIRING PINCERS.—J. Pfeffer, Spokane, Wash. The invention is in the nature of a machine to be used in fastening together by wire, bundles of small boards, such for instance, as are used in making boxes, and for fastening together shingles into bundles, and other similar uses, and it consists in the construction and arrangement of a pair of pincers for cutting and twisting the wire about the bundle.

MACHINE FOR CASTING LEAD SEALS AND THE LIKE.—N. S. Friderichsen, 44 Vester Folledvej, Copenhagen, Denmark. The invention consists in the fact that the casting molds for the seals together with their cores are arranged in a disk rotatable between two stationary disks, this rotatable disk during its rotation receives the lead and automatically cuts off the supply, the seals being ejected from the molds after they have sufficiently cooled.

Prime Movers and Their Accessories.

COOLING DEVICE FOR EXPLOSIVE ENGINES.—G. Braun, 93 Quai de Valmy, Paris, France. The invention relates to means for cooling the cylinders and valve boxes of explosion engines of all kinds, but more especially and with more advantages in the case of the engines of agricultural and other locomobile machines and automobile vehicles, and has for its object to provide an efficient cooling device for such engines.

STEAM-ACTUATED VALVE.—A. Mehlhorn, Dietrichsdorf, near Kiel, Germany. The valve gear is for use for direct acting steam pumps, of the kind in which at each end of the pump piston stroke a piston valve is shifted by moving parts of the pump until a steam inlet is opened, whereupon the piston valve is moved to the end of its stroke by steam pressure alone.

EXPLOSION-TURBINE.—P. O. Poulson, Brigham, Utah. The invention pertains to turbines and gas engines, and the object is to produce a turbine which will be propelled by exploding charges within the same. The general purpose is to produce a prime mover which will be efficient in operation and extremely simple in construction.

Railways and Their Accessories.

METAL RAILWAY-TIE.—J. R. Robinson and J. F. Sugrue, Ennis, Texas. The invention relates to improvements in ties constructed from one piece of metal and provided with integral clamps for the rails. It provides for the cheapest construction of such a tie, without the sacrifice of strength, and to render the tie more or less yielding between the rails, the material cut away in the side flanges to accomplish such a result, being utilized as stays or braces.

Pertaining to Vehicles.

CARBURETER.—P. Bertrand, New York, N. Y., and J. Goubillon, Vaulx en Velin, France. The aim of the invention is to produce a device which will operate to produce a thorough evaporation of the gasoline or other fuel in large quantities, and which will afford means for nicely regulating the vaporization of the gasoline and the proportion of gas and air which passes from the carbureter to the engine.

PROTECTIVE DEVICE FOR RUBBER TIRES.—H. W. Harding, New York, N. Y. One purpose of the inventor is to provide a chain or series of chains especially constructed for introduction into pneumatic tires to protect the area of the tire most liable to puncture, the chains being so constructed and placed that their radial line from the center of the tire within the protected area will pass through at least one thickness of the metal used in the construction of the chains.

Note.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Notes and Queries.

Full hints to correspondents were printed at the head of this column in the issue of March 13th or will be sent by mail on request.

(12021) A. T. G. A. writes: In your issue of October 3rd, 1908, F. B., No. 10867, asks why the days and nights are not equal on the days the sun crosses the celestial equator. I have for many years been impressed with the care, patience, and directness of your answers to the many inquiries. It has been the most interesting column of the paper to me. In this one particular case, however, may I suggest you do not include the main reason for the discrepancy. In some almanacs the time of sunrise and sunset is computed for the instant the first glimpse (or the last) of the sun's disk would be seen on the true horizon. Allowance is made for the semi-diameter of the sun and for the refraction of the atmosphere. This would cause the sun to appear a few minutes earlier in the morning and to be seen a few minutes longer in the evening, making the day (sometimes) 8 or 9 minutes longer than it would otherwise be. When this happens during the time of lengthening days (as in March) it would cause the equal days and nights to come earlier, and to come later in September. The matter of semi-diameter and refraction is not taken into account by all almanac computers, some giving the moment when the center of the sun would be on the horizon if there were no atmosphere. In such almanacs the equal days and nights come exactly on the days of spring and autumnal equinox, but it is only theoretically so. The equation of time would have the effect only of transferring the time of both sunrise and sunset earlier or later, as the case might be, and so would have no effect upon the length of the time of daylight. There would of course be a slight effect due to the change in the equation of time between sunrise and sunset, but that would scarcely amount to as much as one minute. Pardon my "butting in" in this matter. My appreciation of the uniform accuracy of your answers in all other cases causes me to feel you will understand the spirit in which this correction is sent. A. We appreciate the spirit as well as the substance of the above correction or addition to our former reply.

(12022) W. B. asks: Will you please say through your Notes and Queries columns in which direction with regard to the wind does an ice boat sail fastest? Some say that sailing direct across the wind is best, others assert that sailing slightly into the wind is better for fast sailing, while others believe in sailing slightly before the wind. Can it be scientifically demonstrated apart from actual experiment which of these is correct? A. Undoubtedly an ice yacht sails faster across or into the wind than before the wind. It has been conclusively proved by tests over measured courses and accurate measurement of the wind that ice yachts have sailed much faster than the wind. The angle to the wind at which ice boats will sail fastest depends upon the individual design of the boats; some may sail faster into the wind, but it is probable that the majority would make their best speeds at about 90 deg., i. e., with the wind dead abeam or nearly so.

(12023) J. M. asks: What is cement? How is it manufactured? Why is it always called "Portland" cement? A. "Portland" cement was originally so called from its resemblance when set in artificial stone to Portland stone from the celebrated quarries of that name on an island off the coast of Dorset in England. It is made by calcining at nearly white heat an artificial mixture of carbonate of lime and clay in certain proportions and grinding to powder the clinker so formed. All cements are not called "Portland," that name being used in its present sense to distinguish cements which are made of an artificial mixture, from cements of similar properties made in a similar manner from single natural rocks without admixture. The latter are generally called "Rosendale" (from the name of the place where they were first made) or "natural" cements.

(12024) R. S. P. asks: I will thank you to inform me whether salt will destroy (disintegrate) a cement sidewalk? If it does, what is the chemical combination? A. The theory of action of salt water upon cement is not fully understood, some cement structures exposed to the worst conditions having given most satisfactory results, while others under more favorable conditions have failed in a greater or less degree. The chemical action involved is generally agreed to be as follows: When the cement contains a high percentage of lime, all of the latter is not engaged in stable compounds, and when exposed to sea water, the sulphate of magnesia in the latter combines with the lime, forming calcic sulphate and precipitating magnesia. The discovery of magnesia in cements decomposed by sea water at first led to the supposition that the cause of failure was excess of magnesia in the cement when used. The action is assisted when the cement is alternately wet and dry, as between tides, and the sulphate of

lime may be washed out if the cement is sufficiently pervious, more being formed by fresh sea water attacking the lime until the latter is destroyed. It is generally agreed that the better the cement is mixed and placed, with especial view to the density of its surface and impermeability, the less it will be attacked by sea water, more or less regardless of its analysis, the only important consideration of the latter being that its hydraulic index should be high, i. e., percentage of lime low.

NEW BOOKS, ETC.

A HANDBOOK OF SMALL TOOLS. By Erik Oberg. New York: John Wiley & Sons, 1909. 517 large 12mo. pp.; 282 illustrations; cloth. Price, $3.

In the present multiplication of books on all sorts of subjects it is comparatively rarely that one comes across a new publication the subject of which has not already been treated, less comprehensively or less thoroughly or simply earlier, but the present work seems to fill not a "long-felt want" so much as a recently arisen and hitherto unfilled want. The rapid development of highly automatic machine tools and the use of high speeds facilitated by improvements in steel have developed entirely new requirements in the way of tools and the author endeavors to provide instructions in the best modern practice for the benefit of the toolmaker, draftsman, foreman, and shop superintendent. The book is practical and to the point, simple in language, and well suited to the class for which it is particularly intended. The new developments above referred to require more instruction in what tools to make than in how to do it, the latter being generally easily thought out by a good workman, and the author therefore gives his attention primarily to the former. The book is full of useful tables and data for tool making and for those interested the formulæ by which those data are calculated and other simple mathematics are given. The authenticity and originality of the work is sufficiently demonstrated by the fact that it represents the practice of one of the largest and most advanced tool-making firms in the country with which the author was associated for several years.

HOW IT IS DONE: OR, VICTORIES OF THE ENGINEER. By Archibald Williams. New York: Thomas Nelson & Sons. 1908. 12mo.; cloth; pp. 484; 268 ill. Price, $1.25.

In this book the author has described in simple language how the great engineering feats of the world have been accomplished. Among the subjects treated are railroad engineering, the building of a big ship, bridge building (including an account of suspension and cantilever bridges and detailed descriptions of the Forth Bridge, Blackwell's Island Bridge, and the collapse of the Quebec Bridge), the building of the new Croton Dam, curbing the Nile, notable reservoirs, Panama Canal, harbor works, tunnels and tunneling, mining and mines, power from falling water.

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Hook. See Fish hook.
Horn, amplifying, C. Beecroft.... 915,013
Horse detacher, J. S. Williams.... 915,036
Horseshoe, C. Wermstrom.... 914,903
Horseshoe, A. F. Paulsen.... 914,971
Hot air register, C. K. Clark.... 914,731
Humidifying and air conditioning apparatus, S. W. Cramer.... 914,640
Hydraulic motor, J. G. McDowell.... 914,745
Igniter, Mantion & Stanley.... 914,964
Illuminator, V. B. Lansingh.... 915,056
Index, L. L. Dennick.... 914,556
Indicator contact maker, Helm, F. W. Wood 914,826
Insect trap, Heath & Martin.... 914,571
Insecticide, J. W. Lafer.... 914,430
Insele cleaning machine or device, J. F. Noonan.... 914,448
Internal combustion engine, A. L. Galusha. 914,566
Invalid's supporter, E. I. Boyce.... 914,785
Iron cutter, W. R. Walker.... 914,620
Ironing board, A. Kenan.... 914,958
Ironing machine, H. G. Grosse.... 914,716
Ironing machine, G. L. Martin.... 914,993
Jar or bottle stopper, A. P. Lee.... 914,960
Joint chair, railway, D. C. Miller.... 914,593
Journal box lubricating device, J. G. Smith. 914,524
Kinetoscope, J. Keller.... 914,729
Ladder, A. H. Loomis.... 914,436
Lamp, P. Heviandt.... 914,954
Lamp, arc, W. F. Warner.... 914,684

Lamp, arc, W. R. Whitney	915,052
Lamp, electric arc, C. Oliver	914,868, 914,869
Lamp, electric arc, Fleming & Halvorson	914,939
Lamp, hydrocarbon incandescent, H. H. Eason	914,709
Lamp, spirit, Turner & Locke	914,900
Lamplighter, J. L. Bond	914,631
Land roller and pulverizer, W. Pfarrer	914,453
Lantern, tubular, W. C. Winfield	914,688
Lantern view changing device, magic, J. Keller	914,728
Last, S. A. Baker	914,376
Lasting machine, A. J. Gabrielian	914,486
Lead hollow bodies, uniformly covering with, V. Schwaninger	914,459
Lens grinding apparatus, bifocal, B. Meyer	914,591
Life preserver, E. O. Stapp	914,987
Light, binnacle, R. V. How	914,840
Light fixture, portable electric, L. A. Williamson	914,772
Line support, J. D. Hilliard	914,837
Lock, Kadar & Roth	914,423
Lock, E. Gagnon	914,819
Locomotive bells, means to prevent overturning of, C. H. Foster	915,023
Locomotive boilers, system of washing and filling, Otis & White, reissue	12,925
Loom shuttle box motion, J. M. Marco	914,739
Loom stopping mechanism, automatic replenishing, R. Jamieson	914,491
Loom temple, J. E. Prest	914,509
Lubricator, L. Schriever	914,757
Lubricator for handsaws, C. E. Lowe	915,033
Lumber rule, Bryant & McDonald	914,635
Mail bag deliverer and receiver, D. W. Millsaps	914,442
Mail catcher attachment, Crawford & Beck	914,802
Mail crane, I. Light	914,434
Mail delivering apparatus, D. R. Harmon	914,658
Mail delivering apparatus, J. H. Tudor	914,899
Manicure implement, B. M. Smith	915,047
Maps, etc., assisting forecasters in the preparation of weather, A. G. McAdie	914,500
Masonry and steel structure, R. Guastavino	915,026
Mechanical motor, W. J. Comfort	914,926
Megaphone and horn, combination, C. W. Wolf	914,472
Melting furnace, crucible, C. Smerling	914,909
Merchandise hanger, S. S. Weaver	914,469
Metal bearing material, treating precious, Sorensen & Westby	914,680
Metal ladle, molten, Maccoun & Kileen	914,738
Metal window, G. H. Forsyth	914,651
Metals, casting, M. V. Smith	914,679
Micrometer gage, L. Mastrangel	914,855
Milk concentrating apparatus, E. E. Claussen	915,019
Mining machinery, E. S. Bennett	914,917
Miter box, E. W. Whitmore	914,543
Mixer, A. M. Monday	914,495
Mold, J. H. Finkle	914,818
Molds for electrotypes, preparing, G. E. Dunton	914,816
Molded receptacle, H. B. Smith	915,048
Molding machine, F. A. Whitmore	914,770
Motorcycle, S. A. Morse	914,597
Mortising plane, I. W. Letner	914,902
Motive power apparatus, C. J. Lake	914,583
Motor controller, electric, T. S. Perkins	914,972
Motors of motor cars, cooling device for the, Goudard & Mennesson	914,822
Mower guard sharpener, C. & G. F. Batke	914,914
Mowing machine for railway use, O. L. Olson	914,870
Mud guard, J. X. Davis	914,390
Music roll spool, W. S. Denton	914,811
Musical instrument duplex tracker board, automatic, M. Clark	915,018
Needle shower, W. E. Holmes	914,573
Nitric oxids and nitric acid, producing, Diffenbach & Moldenhauer	914,813
Nozzle, C. G. Hess	914,490
Nut lock, T. J. Glenn	914,654
Nut, lock, Davis & Godard	914,930
Nut lock, adjustable, F. Young	914,908
Nutting machine, J. V. Culliney	914,807
Optical illustion device, F. J. Wiedenbeck	914,904
Ore dust from furnace gases, apparatus for removing, C. E. Brinez	914,696
Ore, galvanizer's dross, and the like, apparatus for use in smelting zinc, E. H. Hopkins	914,839
Ores, reducing, N. Wikstrom	914,622
Ores, treating complex sulfid, G. E. Kingsley	914,730
Ores, treatment of, A. L. Dean	914,391
Oxid of iron and zinc sulfate, preparing red, G. Evans	914,649
Ossein, treatment of, Vallee & Heibronner	914,926
Oven, coke, J. F. Donaghy	914,932
Oven continuous heat interchanging arrangement, coke, E. Solvay	914,525
Package clasp, T. Smith	914,761
Package tie, L. A. Strom	914,614
Packing, S. M. Jones	914,422
Packing ring, metallic rod, C. W. G. King	914,426
Pan, See Dust pan.	
Paper, M. B. Diskin	914,394
Paper making machinery, contracting reel for, E. J. Pope	915,041
Paper sack holder, wire, A. H. Jones	914,421
Paper shell machine, J. Chesney	914,384
Paraffin on butter tubs, device for spraying, L. A. Rogers	914,605
Pearl by air currents, process and apparatus for drying, von Morsey-Picard & von Verschuer	914,598
Phonograph horn, G. W. Duncan	914,934
Photographic printing apparatus, T. T. Sabroe	915,044
Piano players, pneumatic for automatic, H. M. Brod	914,549
Pick and crowbar, combined, J. Weis	914,541
Pipe line cleaning device, H. A. Greenan	914,824
Pipe making machine, W. Langenheim	914,851
Pipe or culvert joint, J. P. Zimmer	914,909
Pitman connection for shakers, Parrish & Lamoreux	914,504
Placket closure, E. A. Thomas	914,897
Planing machine, rotary, E. J. Hannum	914,948
Plant protector, J. P. Duval	914,708
Planter, E. St. Aubin	914,890
Planter, corn, M. R. Moffitt	914,858
Plastic material and making same, W. E. Carson	915,060
Platen press, J. Thomson	914,531
Plates for X-ray machines, manufacture of generating, H. H. Williams	914,623
Plow, Paul & Altgelt	914,506
Plumber's clamp, R. D. McDonald	914,743
Plumbing fitting, N. G. Gorcan	914,944
Pneumatically operated device, W. C. Smith	914,463
Pocket knife and opening key therefor, J. H. Wilson	915,007
Polishing machine, P. H. Barz	914,378
Polishing material to buffing wheels, device for applying, F. M. Levett	914,433
Postal card check, E. P. Selden	914,460
Postmarking machine, D. Robertson	914,513
Potato planter, J. R. Fruit	914,564
Poultice case or container, H. J. Dunn	914,935
Powdered material feed regulator, D. M. Pickett	914,973
Power system, water, S. C. Fancher	914,399
Power transmission elements, mechanism for controlling, Allen & Comly	914,374
Power transmission mechanism, R. D. Mayo	914,740
Prepayment meter, W. T. Drew	914,706
Press and attachment therefor, drop, L. G. Bayrer	915,012
Pressure cut off, G. Robson	914,752
Pressure exerting machines, relief mechanism for, W. A. Cornbrooks	914,799
Pressure to tanks and other appliances, apparatus for controlling the application and relief of, A. Priestman	914,673
Printing press lock-up device, G. Kaysser	914,848
Propeller, M. B. Miller	914,857
Pump, counterbalancing device, C. K. Cotten	914,385
Pump, double acting, F. J. Pratt, Jr.	914,457
Rack guard, veil, M. D. Coey	914,705
Radiator, M. E. Danforth	914,929
Rail, G. B. M. Erwin	914,648
Rail and beam tie, A. B. McDade	914,446
Rail bond, F. H. Daniels	914,808
Rail joint, C. O. Thomas	914,616
Rail joint, Kolling & Fischer	914,849
Rail, shifting, D. W. Connell	914,702
Railway and like vehicle bogie, A. Spencer	914,889
Railway automatic danger and safety signal system, A. F. Eells	914,482
Railway automatic electrical system, C. Crandall	914,801

Railway crossing signal, G. A. Davis	914,389
Railway electric block system, C. H. Shaffer	914,461
Railway rail driving device, A. F. Fiala	914,557
Railway rail tie bar, J. H. Crowley	914,806
Railway signal, H. A. Hoeschen	914,412
Railway signaling means, T. W. Stanage	914,611
Railway switch, H. Reed	914,976
Railway tie and fastener, metallic, S. Clary	914,792
Rake automatic cleaner, push, C. H. Russell	914,517
Rake lever mechanism, sweep, D. Plattner	915,040
Rammer, paving, Qvist & Nordstrom	914,903
Razor, S. Ellis	914,842
Razor blade holder, F. C. Gorham	915,024
Razor, safety, B. Klam	914,957
Reamer, J. Gallagher	914,653
Reciprocating motor, J. G. McDowell	914,744
Respirator, G. F. Jaubert	914,576
Reversing switch, J. Dalziel	915,053
Ribbon roll clasp or guard, T. H. O'Brien	914,795
Ring tray, safety, C. E. Fowler	914,563
Rim compressor, A. F. Hansen	914,949
Rock drilling engine, J. G. Leyner	914,737
Rod connection, tie, P. Monson	914,496
Roller. See Harvester snapping roller.	
Rolling mill, F. C. Biggert, Jr	915,014
Rotary engine, J. S. Alcorn	914,627
Rubber heel, removable, J. H. Dempsey	914,810
Saddletree, B. F. Amos	914,546
Sand blast machine, F. P. Boland	914,783
Sap spout, W. W. Powell	914,456
Sash balance and lock, F. D. Anthe	914,692
Sash lock, C. E. Hennies	914,410
Sash lock, W. F. Webber	915,001
Sash lock, window, D. Reinmiller	914,750
Sash fastener, N. Marschall	914,853
Scraper, wheeled, A. H. & L. L. Smith	914,610
Screen hanger, eaves trough, W. Feyler	914,650
Screw driver, A. Whisler	915,003
Seal press, H. C. Pomeroy	914,672
Self-locking box, E. K. Davis	914,909
Selvage holder, float filling, J. Hargreaves	915,027
Sewing machine tape tension device, C. Weiss	914,769
Shearing machine, F. H. Daniels, et al	915,020
Sheet metal blank, gang die for cutting, D. P. Robinson	915,042
Shelving, G. Holden	914,572
Shelving, B. L. Waters	914,685
Shipping package holder, S. Bonini	914,632
Shoe, A. J. Gabrielian	914,485
Shoe attachment, rubber, Bracken & Ward	914,477
Shoe holder, G. E. Hart	914,952
Shoe lace fastener, C. J. Anderson	914,628
Shoe tying device, P. K. Snyder	914,983
Shoes, making, S. A. Baker	914,377
Shovels, spades, and other tools, handle for, F. Skelton	914,678
Shutter bower, etc., bracket, H. Zimmerman	914,773
Shuttle, R. Crompton	914,703
Sign, Malmquist & Frederickson	914,493
Sign, S. L. Aarons	914,775 to 914,777
Skates, removable brake and guard for roller, A. R. Rieger	914,458
Skidding machine, log, Miller & Dickinson	914,441
Skirt, W. W. Hook	914,414
Skirt gage, C. Wets	914,542
Sleigh runner, W. E. Turner	914,901
Slicer, F. P. Dunn	914,645
Slotting device, O. O. Storlie	914,613
Smoking appliance, F. A. Tarara	914,991
Smoking pipe, dry, F. Muller	914,498
Soap holder, W. R. Vandewerker	914,619
Sock supporter, S. W. Bishop	914,380
Sound damper, E. Renz	914,879
Spark plug, A. V. Pellet	914,451
Spark plug, F. J. Watt	914,540
Speed mechanism, variable, A. L. De Leeuw	914,643
Speed recorder, Henkle & de La Monte, 914,834, 914,835	914,850
Spindle, J. R. Coe	914,794
Spindle locking mechanism, L. Thiel	914,527
Sprinkler system automatic alarm, G. O. Haskell	914,569
Sputo cup and holder, F. C. Jonah	914,725
Station indicator, C. R. Casner	914,550
Steam generator, C. L. Thudichum	914,618
Steel, H. D. Booth	914,633
Stirrup, safety, J. A. Batson	914,630
Stock fountain, J. B. Hawkins	914,570
Storage battery, E. C. Ekstromer	914,646
Stove, E. R. Caboone	914,922
Stove, coal burning, G. G. Kaiser	914,817
Stove, heating, E. R. Caboone	914,923
Stovepipe, E. U. Phillips	915,039
Stovepipe thimble and flue stopper, D. G. Lilley	914,586
Stump extractor, J. Bradley	914,920
Sugar cane mill, J. & C. McNeil	915,036
Sulky, T. Wilson	915,008
Suspenders, W. Freeman	914,404
Switch, Rolfe & Fox	914,515
Syringe, H. F. Ong	914,871
Syringe, J. R. Harris	914,950
Table, O. J. Rogers	914,514
Tag, W. L. Hall	915,054
Talking machine, L. P. Valiquet	914,765
Talking machine, D. S. Edmonds	915,022
Tanks and other appliances, apparatus for controlling the admission and relief of pressure to, E. C. Moore	914,497
Tanks, etc., overflow device for pressure, W. H. Ridgway	914,978
Tanning composition, I. I. Burrows	914,382
Telegraph repeater, G. L. Rawdon	914,877
Telegraph system, multiplex, T. Giara	914,713
Telemeter, stereoscopic, C. von Hofe	914,838
Telephone disinfector, M. A. Dohney	914,395
Telephone lock out, party line, Wagner & Shiels	914,468
Telephone registering mechanism, Greene & Fort	914,715
Telephone system, F. W. Wood	914,690
Telescope sighting attachment, transit, G. N. Saegmuller	914,754
Thermostat, G. A. Moore	914,859
Thill coupling, C. N. Jackson	914,575

Tie attachment, W. T. Hulscher	914,416
Tile, J. A. McKee	914,862
Time indicating device, S. P. Thrasher	914,534
Tire, vehicle, W. D. McNaull	914,599
Tire, wheel, J. Christy	914,551
Toilet article, H. Straus	914,682
Tongue depressor, E. Hubbell	914,415
Tool, combination, E. H. Nylin	914,601
Tool, engraving, H. W. Wells	914,621
Tool, fluid pressure, F. Polzer	914,602
Tool sectional tubular handle, Cooley & Marks	914,552
Tool tubular handle, Cooley & Marks	914,554
Track joint, H. A. Myers	914,443
Track sander, C. W. G. King	914,425
Train controlling mechanism, J. G. Schiver	914,521
Tramway, aerial, C. A. Dunlavy, et al	914,397
Transformer, H. B. Smith	914,981
Transformer structure, C. L. Fortescue	914,941
Trigger mechanism, single, J. D. Russ	914,516
Trolley base, J. A. Hanson	914,719
Truck, J. F. King	914,427
Truck, casket, C. H. Lannert	915,032
Truck, tongue, J. A. Stone	914,466
Tunneling machine, rotary, C. A. Case	914,636
Turbine, fluid, F. E. Wolf	914,625
Typewriter ribbon movement, C. S. Nickerson	915,037
Typewriting machine, B. C. Stickney	914,612
Typewriting machine, C. S. Nickerson	914,667
Typewriting machine, A. T. Brown	915,015
Typewriting machine, E. F. Kunath	915,030
Typewritten documents, method and apparatus for duplicating, M. Soblik	914,464
Umbrella, E. A. Loomis	914,662
Vacuum gage, H. W. Maurer	914,696
Valve, E. H. Gold	914,407
Valve, F. Schreidt	914,886
Valve, N. C. Walterthum	914,907
Valve, automatically closing, E. Bech	914,547
Valve, balanced, J. T. Wilson	914,471
Valve, balanced slide, J. T. Wilson	914,470
Valve, compressor, N. A. Christensen	914,699
Valve, dry pipe, G. I. Rockwood	914,883
Valve, engine, B. V. Nordberg	914,747
Valve for steam radiators, automatic, I. Hutchins	914,418
Valve mechanism, A. W. Wilker	914,771
Valve mechanism, O. Bartel	914,913
Vault closure, T. F. Kelly	914,424
Vault door, J. C. Sparrow	914,681
Vehicle, J. Repetto	914,880
Vehicle axle swaging machine, F. M. Caesar	914,480
Vehicle chock, A. L. Swearingen	914,894
Vehicle extension top, W. Leppert	914,961
Vehicle, motor, N. S. Dunaway	914,933
Vehicle pneumatic buffer, self-propelled, M. P. Hayward	914,831
Vehicle propelling mechanism, W. H. Summers	915,058
Vehicle propelling mechanism, motor, S. S. Morton	914,968
Vehicle tire, R. B. Calcutt	914,481
Vehicle wheel, J. E. Harrod	914,659
Vehicle wheel, P. Ebner	914,710
Vehicle wind shield, F. A. Dillingham	914,557
Velocipede, M. L. Jenkins	914,845
Velocipede pedal, E. G. Batta	914,736
Vending machine, H. A. Thexton	914,995
Vending machine, coin controlled, J. J. McCarthy	914,444
Vessel, J. Battersby	914,693
Vessels, pneumatic propulsion of, E. Wilde	915,004
Vest shirt, negligee, E. Jaffe	914,955
Vulcanizer, J. K. Williams	914,905
Wagon, carriage, etc., thill, Coodey & Marks	914,553
Wagon, delivery, Holland & Silver	914,722
Wagon dump and elevator, F. Gahm	914,565
Wall paper drying apparatus, W. J. Vornhold	914,767
Warp leasing apparatus, O. Fischer	914,401
Washbasin attachment, L. J. Monahan	915,057
Washboard, M. A. Henle	914,836
Washing machine, A. A. Dorr	914,642
Washing machine, E. Hacker	914,717
Washing machine, rotary cylinder, C. Jensen	914,577
Waste water straining device, O. Schumann	914,758
Water closet, E. G. Watrous	914,539
Water closet seat protector, G. F. Thompson	914,898
Water heater, portable, S. M. Dick	914,393
Water meter, M. Miller	914,440
Water, purifying, C. W. Schultze	914,887
Wax extractor, J. Y. Peterson	914,874
Weight and cost scale, automatic, M. Unger	914,764
Welding, F. G. Haldy	914,946
Well drilling derrick attachment, N. J. Jones	914,579
Wheel. See Vehicle wheel.	
Wheel, J. C. Jackson	914,844
Wheel, Glasrud & Anderson	914,942
Wheel antiskidding device, E. C. Gardner	914,712
Wheel rim locking ring, R. S. Bryant	914,381
Whiffletree coupling, J. B. Kriner	914,428
Windlass, O. Kuehne	914,582
Window chair or platform, safety, J. P. Lundquist	914,852
Wire and metal cleaning bath, J. C. Beneker	914,916
Wire connector, A. Schmidt	914,046
Wire reeling machine, H. F. Villwock, Jr.	914,908
Wire stitcher, H. A. Olsson	914,698
Wire stretcher, L. Miller	914,595
Wire stretcher, L. Riggins	914,604
Wrench, A. B. King	914,580
Wrench, J. R. Bailey	914,629
Wringer, H. L. Dietz	914,814
Yarn or textile thread stretching machine, P. Piepenbrink	914,454
Yoke end, neck, I. L. Draucker	914,558

DESIGNS.

Bath tub for bird cages, M. Bolgner	39,869
Desk for hotel registers, J. H. Smith	39,872
Electrical connector, H. G. Pape	39,870
Emblem, E. A. Martin	39,865
Medal or emblem, J. L. Charbneau	39,866
Monument, memorial, A. Neuschotz	39,864
Plate or platter, L. Rouquart	39,868
Pot or cowl for chimneys or ventilating shafts, D. McLean	39,871
Stick pin, H. M. Willis	39,867

TRADE MARKS.

Alfalfa meal or ground hay used as a stock food, M. C. Peters	72,989
Automobiles, Chalmers-Detroit Motor Co.	72,958

SEALED PROPOSALS

Notice to Contractors.

SEALED PROPOSALS for Power House, Coal Pocket, Trestle and Conduit, Construction including plumbing, also Conduit for Acute Hospital, Construction including steam piping, at the Hudson River State Hospital, Poughkeepsie, N. Y., will be received by the State Commission in Lunacy, at the Capitol, Albany, N. Y., up to 3 o'clock P. M., on March 24th, 1909, when they will be opened and read publicly.

Proposals shall be accompanied by certified check in the sum of $2,000 for the Power House, Coal Pocket, Trestle and Conduit, and certified check in the sum of $600 for the Conduit for Acute Hospital, and the contractors to whom the awards are made will be required to furnish surety company's bonds in the sum of $25,000 for the Power House, and $3,000 for the Conduit for Acute Hospital. The right is reserved to reject any and all bids.

Drawings and specifications may be consulted and blank form of proposals obtained at the Hudson River State Hospital, Poughkeepsie, N. Y., and at office of the State Architect. Complete sets of plans and specifications will be furnished to prospective bidders upon reasonable notice to, and in the discretion of the State Architect, Franklin B. Ware, Albany, N. Y.

NOTE.—The work for the Power House does not include boilers or other equipment. T. E. MCGARR, Secretary, State Commission in Lunacy.

Dated Albany, N. Y., 26th day of Feb., 1909.

Notice to Contractors.

SEALED PROPOSALS for Power House, Coal Pocket and Conduits construction, including plumbing and electric work, and for Laundry building construction, including heating, plumbing and electric work, at the Kings Park State Hospital, Kings Park, N. Y., will be received by the State Commission in Lunacy at the Capitol, Albany, N. Y., up to 3 o'clock P. M., on March 24, 1909, when they will be opened and read publicly.

Proposals shall be accompanied by certified check in the sum of $2,000 each for the Power House and Laundry, and the contractors to whom the awards are made will be required to furnish surety company's bond in the sum of $25,000 for the Power House and $5,000 for the Laundry. The right is reserved to reject any and all bids.

Drawings and specifications may be consulted and blank forms of proposals obtained at the Kings Park State Hospital, Kings Park, N. Y., at the office of the State Commission in Lunacy, Room 3212, 1 Madison Avenue, New York City, and at the office of the State Architect. Complete sets of plans and specifications will be furnished to prospective bidders upon reasonable notice to, and in the discretion of the State Architect, Franklin B. Ware, Albany, N. Y.

NOTE.—This work does not include boilers or other equipment in the Power House, or laundry machinery. T. E. MCGARR, Secretary, State Commission in Lunacy.

Dated February 26, 1909.

Belting and hose, New York Belting and Packing Co.	73,022
Belting, hose, and machinery packing, New York Belting and Packing Co.	73,021, 73,023
Belting, hose, and machinery packing, Mechanical Rubber Co.	73,046
Blasting machines and electric batteries, Eastern Dynamite Co.	73,039
Boiler scale, compound for removing and preventing, Schoellkopf, Hartford & Hanna Co.	72,976
Bottles, prescription, McPike Drug Co.	73,014
Canned and evaporated fruits, Griffin & Skelley Co.	73,005
Canned, dried, and evaporated fruits, Griffin & Skelley Co.	72,961
Canned vegetables and fruits, Fogg & Hires Co.	73,041
Chemical preparation for producing effervescing baths, L. Sarason	72,968
Chocolates and bonbons, H. Heide	72,962
Cigars, C. Pearson	72,988
Cigars, Rotan Grocery Co.	72,980, 73,051
Cigars, cigarettes, and tobaccos, E. Regensburg & Sons	72,983, 72,984
Clothing, certain, J. M. Kinney	73,011
Cooking utensils, metal, Avery Stamping Co.	72,994
Drills and drill chucks, Whitman & Barnes Manufacturing Co.	72,991
Electric appliances, certain, Economy Electric Co.	73,040
Fabrics, open mesh, woven, textile, L. E. Palmer Co.	73,008
Flour, wheat, Sneuz & Co.	72,967
Flour, wheat, Kehlor Flour Mills Co.	73,045
Fur wearing apparel, Mischo & Miller	73,016
Game counters and chips, United States Playing Card Co.	73,052, 73,054
Glass shades and globes, Phoenix Glass Co.	73,035
Gloves, cloth, leather, and silk, Bachner-Moses Co.	72,996
Gloves, leather and silk, Carson Pirie Scott & Co.	72,997
Grape juice, unfermented, Randall Grape Juice Co.	73,050
Hacksaws, Henry G. Thompson & Son Co.	72,985, 72,987, 72,043
Hair tonic, A. L. Worthing	72,992
Hose, Mechanical Rubber Co.	73,015
Hose, New York Belting and Packing Co.	73,023, 73,032
Hose, garden, Hibbard, Spencer, Bartlett & Co.	73,044
Insect and rodent destroyer, F. N. Thimble	72,978
Iron and steel, United States Steel Products Co.	73,055
Jewelry, certain, B. A. Bailou & Co.	72,995
Lamps for motor vehicles, oil and gas, Packard Motor Car Co.	73,034
Malt extract combined with lactic ferment, Franco-American Ferment Co.	73,003
Marsh mallows, Clark Sales Co.	72,999
Medicine for heart disease, Knoll & Co.	73,012
Metal polish, F. T. Lord Polish Co.	73,002
Metal polishes, Cancos Manufacturing Co.	72,981
Metal polishes, K. B. Lapham	73,013
Microphones, apparatus for improving the phonetic effect in, H. H. Berg-Jaeger	73,038
Oils and greases, lubricating, Packard Motor Car Co.	73,048, 73,049
Ointment for catarrh, J. D. Delisle	72,959
Ointment for external application, C. J. Britton	72,957
Packing, machinery, New York Belting and Packing Co.	73,019, 73,020
Packing, rubber, leather, asbestos, and metal, F. Burgmann	73,057
Paint, white lead, white zinc, and varnishes, house, Warren Paint Co.	73,056
Paper, Hawley Pulp and Paper Co.	73,007
Perfumes, violet, Schimmel & Co.	72,973, 72,975
Photographic nitrocellulose, varnish, and collodion, Ansco Co.	72,980
Popcorn, shelled, Albert Dickinson Co.	72,979
Registers, National Cash Register Co.	73,047
Remedy for diseases of the feet of animals, Souder & Co.	72,977
Rubber mats and mattings, New York Belting and Packing Co.	73,017, 73,018
Salt, natural aperient, A. Saxlehner	72,970
Salts obtained from natural mineral water, bitter, A. Saxlehner	72,969, 72,971
Salve, C. Mayer	72,965
Shingles, R. J. Menz Lumber Co.	72,966
Soap, toilet, T. M. Sayman	72,972
Stoves and ranges, Globe Stove and Range Co.	73,004
Suspenders and men's garters, A. Ziegler & Sons Co.	72,993
Traps and valves, G. Cody	73,001
Type cleaning compound, Duryea Manufacturing Co.	72,892
Vinegar, apple, Kistler Brothers	72,963
Washing fluids, detergent, J. W. Cheshire	72,958
Water closets, Cochran, Drugan & Co.	73,009
Water, natural mineral, A. Saxlehner	73,036, 73,037
Wheel tires, rubber or rubber and fabric, Hartford Rubber Works Co.	73,006, 73,042
Whisky, blended, L. W. Levy & Co.	72,964
Whisky, blended, James Olwell & Co.	72,009, 72,010
Windows from becoming clouded or frosted, composition for preventing, A. Goldstaub	72,960

LABELS.

"Bryant's Marjoram Cream," for a medicinal preparation, M. K. Bryant	14,698
"Caricatures De Bois Designed By 'Bourdon,'" for caricature figures, M. H. Richardson	14,703
"Car-Bo-Thymol," for a liquid antiseptic compound, Car-Bo-Thymol Co.	14,699
"Carter's Dental Outfit," for toothache drops, E. W. Carter	14,700
"Edelweiss Fruhstuck Kaschen," for cheese, S. Van Korngut	14,697
"El Converso," for cigars, Moeble Lithographic Co.	14,692
"Golden Hour," for stogies, Florida Havana Cigar Co.	14,693
"Hires' Household Extract," for root beer extract, Charles E. Hires Co.	14,694
"Klean Kloth Hand Kerchiefs," for handkerchiefs, F. J. Crystal	14,704
"Napanee Foot Powder, for foot powder, L. N. McCleer	14,701
"Occo-Nut Chews," for nut flavored candy chews, W. B. McCoy Co.	14,696
"Pussy," for cigars, K. H. Jacobs	14,691
"The Brilliant Shoe Dressing," for a dressing for ladies' and children's shoes, Lipshitz Bros.	14,702
"The Popular Drink Breeze," for a beverage, D. H. Williams Co.	14,695

PRINTS.

"Automatic French Polish," for a polish, C. P. Bennett	2,437
"Our Advocate," for men's and boys' coats, vests, and trousers, Ed. V. Price & Co.	2,439
"Richmond," for boilers, radiators, heating and plumbing supplies, Cameron Schroth Cameron Co.	2,440
"Wunderhose," for hosiery, Richmond Hosiery Mills	2,438

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